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RAILROAD GAZETTE

A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS

(Established in April, 1856)

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RAILROAD GAZETTE

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THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

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PASSAGE OF THE HEPBURN BILL AND OTHER RAILROAD LAWS.

After the conferees on the rate bill had made two unsuccessful attempts to draw up a report satisfactory to the Senate they finally succeeded at the third trial and the bill was passed and received the signature of the President on the evening of June 29, the day before the adjournment of the session. Under the terms of a joint resolution subsequently adopted by both Houses and signed by the President the law does not become effective until 60 days after its passage, which will be August 29. The object of this resolution postponing the taking effect of the law is to give to the railroads time to make necessary amendments in their tariffs filed with the Interstate Commerce Commission so as to make them comply with the new law, which requires them to show all charges of every kind, including terminal charges, icing charges, and every charge that is made in connection with transportation. It is also intended to give the express companies and sleeping car companies time to prepare and file their tariffs.

The two main points in controversy in the conference were as to the pass amendment and the proposition to except pipe lines from the provision prohibiting carriers from transporting commodities produced or owned by them. The agreement finally reached as to the pass amendment permits the giving of passes to most of the classes of individuals fairly entitled to them and also permits their being given to some classes included in the original Senate amendment for purely demagogic reasons. The commodity amendment was finally changed so as to apply exclusively to railroads, thus permitting pipe lines to continue to transport their own oil.

In addition to the rate bill a large number of other bills affecting railroads were introduced during the recent session of Congress, but only a few of them were reported by the Committees to which they were referred. A bill of particular interest to cattle shippers and to railroads that carry live stock which became a law was that extending from 28 hours to 36 the time during which cattle, sheep, swine or other animals carried in interstate transportation can be allowed to remain in cars without unloading. A determined effort to defeat this bill was made by some of the humane societies of the country, but Congress was convinced that it was often more humane to allow cattle to remain in cars 36 hours than to unload them at the expiration of 28 hours regardless of whether or not they were at a point where they could be cared for properly.

A third bill of importance was that making railroads liable for the death or injury of employees when such death or injury results from the negligence of a fellow servant. This was noticed last week, page 689.

Another bill which made considerable progress toward enactment was that introduced by Senator La Follette proposing to make it unlawful for a railroad company to require its employees to remain on duty for more than 16 consecutive hours. This bill was favorably reported by the Senate Committee and was the subject of a prolonged debate during the latter weeks of the session. Senator La Follette endeavored to have it voted on before adjournment, but the best he was able to do was to obtain unanimous consent that it shall be voted on in the next session of Congress on January 10. It goes over until the next session with a large number of amendments pending. A similar bill introduced in the House of Representatives by Representative Esch was not reported from the Committee on Interstate and Foreign Commerce.

Several bills introduced at the instance of banking interests proposing to prescribe uniform bills of lading that would be negotiable were practically killed by the adoption of the bill of lading amendment to the rate bill. This amendment will make bills of lading negotiable and will hold the initial carrier responsible for the value of all goods lost or damaged the same as though the loss or damage occurred on its own road. A bill requiring common carriers engaged in interstate transportation to check baggage through to its destination where the presentation of such baggage is accompanied by the presentation of transportation *in any form*, to the destination, was passed by the House, but was pending in the Senate Committee at the end of the session.

Among the bills of interest to railroads that were not reported from the committees to which they were referred were the bill introduced by Representative Esch to require the gradual introduction by all railroads of the block system; the bill introduced by Representative Beall providing for the investigation of controversies concerning wages, hours of labor, or conditions of employment affecting interstate commerce; the joint resolution introduced

by Representative Jenkins requiring the Postmaster-General to compel the railroads within one year to furnish electrically lighted cars for the transportation of mail, and the fantastic measure introduced by Senator Newlands as a substitute for the rate bill proposing to provide for the incorporation of railroads and navigation lines by the Federal Government.

THE CORPORATION INVESTMENTS OF CORPORATION OFFICERS.

When industry was conducted by master, journeyman and apprentice the only outlet for the ambition of the apprentice was to become a journeyman; and of the journeyman to become a master. Therefore, the goal of the lad who did not enter a profession was expressed as "going into business for yourself." This traditional phrase has not been heard so much during these late years of corporate development. Yet even in this day the attainment of a competence is considered commendable and to this end not only accumulation but investment. Those who study and are clearest headed in perceiving the possibilities of this and that phase of industry and commerce naturally see the opportunities for gain. If this perception be of workers on salaries and aggrandizement follow their investment of savings or secured credit, should there be objection if the effort and allegiance due to their paymaster be not diminished?

The investments of the servant of a corporation may be in the shares and securities of the corporation that employs him, or in the shares and securities of other corporations; or in real estate, or in some business that is not conducted under the corporate form. Participation by employees in corporate capitalization is urged as one form of the much praised profit sharing, and corporations that have given those on their pay rolls special facilities for becoming the owners of its obligations have been much lauded. It is argued that employees will work more heartily for the interests of the whole organization if they share in its rewards. To enlist the employee's fullest co-operation, it has been the custom of many corporations, when a man has demonstrated unusual efficiency in its behalf, either to make him a present or to permit him, under easy conditions, to obtain a permanent interest in its operations. It also seems pretty evident that a keen, well-balanced brain should know more about the possibilities of the business of which it is a part, and in case these possibilities seem to offer remuneration, to endeavor to participate in them. The origin of thousands of the fortunes of this country has been in the faith and courage of men who have devoted years of steadfast struggle to enterprises to which there has been opposed the consensus of opinion, until at last the purple flowers have been made to blossom on the thorns.

But there are other well-known phases of the ownership by an officer of shares and securities in his corporation. The use of "inside information" to hammer down their market values and thereby cause loss to innocent investors; the formation of "wheels within wheels" to wrest profit that belongs to these investors is criminal. The question is, should the ownership of its shares and securities by the officers and employees of a corporation be prohibited, or should the abuse of such ownership be made a breach of trust and penalized. The former would place the salaried servants of our corporations on the same basis as the officers of our Army, the Judiciary, and other servants of our Government, who for moderate compensation perform inestimable service; for which they obtain no further reward than that which pertains to useful work well done. In an ideal state of society this certainly would be an ideal status.

In a prosperous country, such as ours, there are in nearly every community openings for lucrative trade. There are always the possibilities of real estate; the railroad agent, who ought to be as bright and competent a fellow as can be obtained in the town, can usually judge from the receipts and shipments of freight what the business of the community is and what its prospects are. If it does not hamper his service to the company to do so, should he be deprived of the opportunity to risk his judgment as to the enhancement in value of a farm, or a town lot, or may he not furnish part of the capital for a butter and egg business, or even retail a carload of coal? The division superintendent, division freight agent, general manager, or other officer may be the very first one to see that an increasing development of the region demands a cement plant or other building industry. If his service to the company is not impaired, should both he and the community be debarred from the benefit of that perception? The executive officers of a railroad company, especially those in charge of traffic, are peculiarly in touch with the tides of commerce, the ebb and flow in the supply of and demand for commodities. When it is obvious that there is need for the opening of a new coal field, that conditions favor the success of a new steel mill, that there should be an extension of the cotton area, should they, provided they give neither time nor attention that belongs to the service of their companies, be deprived from obtaining a share of the advantage that may accrue from the new development which gives employment to increasing numbers? Under the corporate regime should they be withheld from purchasing holdings in the corporations under whose auspices the new development will be made?

Is not the perception of the needs of commerce, and action in accordance therewith the very essence of industrial progress and commercial development? The manufacturer may extend his sphere until he has established or participates in the retail stores through which his products are sold; or a progressive retailer may purchase the output of factories for disposition through his stores, and ultimately the factories themselves. So, also, with one corporation and another. The publishing company may purchase a paper mill; the steel corporation absorb mills, mines, railroads and steamboats. Those whose knowledge of business is the most intimate, who have the best sources of information, whose powers of concentration are greatest, and whose insight is keenest, are those who rise to the leadership of business just as the effective general rises to command in war. Hence we find that dominant directors in manufacturing corporations are also dominant directors in railroads and dominant directors in banks. But as the efforts of the general go for naught without the co-operation and devotion of his army, so also is the enterprise of the captain of industry without avail, not only unless the platoons and brigades of his corporation respond to his directions, but also not unless those directions are in the line of satisfaction to both the producer and the consumer. The progress of industry is bound up in the progress of the people; the captain of industry is as much the servant of the state as is the general.

When, however, the possibilities of gain from business investment are considered there should not be forgotten the possibilities of loss. The man of moderate salary, who has made investment in outside ventures that go awry, who has purchased stocks and bonds that are depreciating, passing dividends and defaulting, will almost certainly have his mind so distracted that attention to his regular duties will be impaired. What happens to the persistent dabbler in stocks on margin and the patron of the bucket-shops, everybody knows, but this is simply gambling and its practice should disqualify a man from creditable employment, the same as any other form of gambling. The question is, should the salaried worker be debarred from taking the chances of business gain because of the possibility of business loss?

When a servant because of interest in a patron treats that patron with greater consideration than his employer's duty to other patrons makes fair he is not performing the service for which he has been paid, is not rendering the allegiance that is his employer's right; and this is pre-eminently the case when that employer is a common carrier. That this evil, in various forms, permeates modern business is known to everyone. The legislature of New York has attempted to stem it by enacting a law that provides penalty for the giving to or the taking by an employee of a commission. The tip to the waiter that was at first intended to elicit especial attention, custom has made general until it is regarded as part of his wage. And so, likewise, with the fee to the porter and the bell-boy. More questionable is the fee to the baggageman who winks at excess weight. When a gratuity is offered to the employee of another for doing what he ought to do as part of his duty, the borderland of bribery is approached and if it lead him to do more than he ought to do, it is passed. Yet it is human nature to try to get the best cuts from the butcher. We know that salesmen are paid premiums by manufacturers for pushing their goods to the fore, that buyers of all kinds from the hotel steward and the rich man's butler to the purchasing agent of a railroad company, are sought by insidious guile to accept an indirect commission, or a direct bribe. The gift to a railroad officer of stocks or bonds of a business which can thrive or shrink because of his attitude toward it is evidently a bribe; ownership thus obtained cannot be classed as investment.

Were all business completely purged of such stultification the world would be vastly better, civilization would be advanced; and it is to be hoped that the extraordinary wave of moral indignation now sweeping throughout this country is beating upon shores that

may never again be free from its cleansing tide. To the efforts of public opinion the despots of governments and corporations alike are obliged to bow. While the great current of public opinion undoubtedly flows toward justice and the utmost good to all, its storm-tossed waves now and then may wreck the craft in whose crew there is no mutiny, nothing more than minor insubordination and petty peculation that a few days in chains or the bastinado would completely cure. The temperament of the American people is largely emotional and of late, while there has been much of well directed and altogether laudable investigation and hewing to the line, their emotion has been lashed into froth by those who would use it to further despicable ends.

The basis for some of the muck rake articles reminds one of the recent riot on the east side of New York started by one report of petty practitioners who wanted the work, that the throats of school children were being cut; and all because Board of Health doctors were making examinations and rendering needed service gratis.

In the ancient festival, by panoplied attendants the sacred bull in gorgeous canopy was led through the lines of the bedecked populace. But six years ago public opinion in the United States, dazzled by the glitter of new-made millionaires, walked admiringly by their side enraptured by their barbaric display. When the bull becomes enraged and breaks his leash he is overwhelming in his might but he recks little whom he gets upon his horns.

The scalpel that cuts the excrescences from the body politic should be guided not only by the clear eye and the steady nerve, but by the brain that can distinguish to the utmost between structure and action that is normal and healthful; and the tissue and function that are evidence of disease. Here it may not be out of place to say that our beloved David who has marched with his slungshot boldly up to the modern Goliath has had no business training; indeed, as is well known, he lost half of his patrimony in unsuccessful ventures and then placed the remainder in the hands of his uncle to be conserved; nor has he had the analytical training given by study of the law. The stirring up of the governmental agencies to that investigation and prosecution which the enforcement of the law has long demanded at their hands cannot but redound to the credit of the Government and of the country, but there is needed the counsel of the sage to ensure that while the tumors are being cut a vital organ be not punctured.

THE GOLDEN RULE AND THE IRON RULE WITH FOREIGN FREIGHT CARS.

What might be called the psychology of freight-car service would be an interesting study for one who is possessed of an active subliminal mentality, and therefore able to guess the subliminal tricks of other personalities: men in charge of cars perform such astonishing tricks of reasoning. Wrongful diversion of cars is a great evil at the present time. The evil in its worst form is comparatively new. The per diem plan for settlement of interchange accounts is also new. Ergo, the new plan is responsible for the new evil. This seems to be the reasoning of most or all of those who have spoken most vigorously on the subject at car service meetings, yet no one of them shows any ground for his conclusion. Diversion is due to the promptings of the devil, just the same now as 10 or 25 years ago. These speakers seem to take a very superficial view. Those of whom they speak—the diverters—pursue an opposite course. No one accuses them of keeping on the surface of things. On the contrary, their thoughts are so far beneath the surface that no fellow can find them out; so obscure that a man, or, at least, a railroad, seems often to think that he does a certain thing when he does not do it. For example, in a certain Southern state, it is said, cars have been reported delivered to another road (to break penalty), when, in fact, they continued standing exactly where they were. Only a "paper" delivery was made.

Probably the diverter's reasoning is not very complete. Under the per diem principle an owner is sure to get some pay for his car, while it is away from home, instead of being constantly liable, as formerly, to be defrauded by an unprincipled borrower. Therefore, it is fair to keep the car away from home forever. That, apparently, is the logic, charming in its simplicity, which has been used during the past two years to justify thousands of unjust acts in connection with other people's property. The fact that the pay is very inadequate is ignored.

Yet everybody knows that the fundamental and original principle, that cars are exchanged, not borrowed or hired or lent, still remains the only legitimate basis for using freight cars in joint service. It is just as true now as in 1865—and just as important that the truth be recognized—that a car sent off from its home road is sent to carry or to get a particular shipment, and that its use for any other purpose is utterly unwarranted, except with the owner's consent. (Its use on the return journey to carry loads to intermediate points is universally assented to.) In the absence of car pools, or pending the difficult and probably slow process of forming pools, the only hope of improvement lies in a return to this fundamental idea, whatever may be the cost of so doing.

We exchange cars for specific shipments instead of leasing them unconditionally, for the very good reason that we have not been able to formulate any workable plan for conducting the leasing or letting equitably. It would be necessary to have different rates for cars of different capacities and varying rates to correspond at different seasons with the varying need for cars at home—as moneylenders in Wall Street change their rates for call loans from day to day. Rather than try to work such a big piece of clerical machinery, we stick to the plan of an arbitrary rate, which is often unjust, but which is simple enough to be workable.

But a low arbitrary rate could not be justly tolerated for a single day without the provision for prompt and automatic return of cars to owners. And, unless there is compensation in the division between the several roads of the charge for carrying the freight which the car is used for, the arbitrary rate must always depend also for its justice largely on the principle of exchange; on each road being a borrower and a lender in equal proportions. The greater the variety in the capacities of cars, and the greater the fluctuation in volume of traffic, as between active seasons and dull seasons, the more important does it become that each road own sufficient cars to provide for its share of the work, as measured by the time it takes to perform the work (loading, transportation and unloading). It may fairly be said that the need of sticking to a single arbitrary rate for car service is now stronger than ever, for the reason that the difficulties of agreeing on equitable rates for all the different kinds of service are more perplexing than ever.

If each car service manager could, without delay, telephone to every other car service manager, and if each could (*and would*) promptly make his agents and yard masters carry out the promises which he would make to return foreign cars which were thus telephoned for, all would be well. Is there any hope of approximating this ideal condition? This is a problem that must be faced, whether we do or do not adopt a general penalty for diversion of cars to a third road, for often it will be necessary to protest against or prohibit the misuse of your cars while they still remain in the present borrower's possession. It would be very nice to have an automatic penalty rate, to apply regardless of the road on which the car might be, and to be easily adjusted to the needs of the rush season; but that seems far in the distance. To be satisfactory, it would have to vary from, say, one dollar after 30 days to five dollars after 10 days, and agreement on a plan would be only the beginning of troubles. The necessary continual readjustment of the plan to changing conditions would be as difficult as to reform the conscience of a rate-cutting freight solicitor. The only course possible under present conditions is to follow each car, or small bunch of cars, as closely as would be done for the merchandise of an important or an overbearing shipper. A superintendent cheerfully (cheerfully in the technical sense!) follows a hundred refrigerator cars through every step of a thousand mile journey on his own road, even at the expense of a bunch of telegrams an inch thick. Is it not possible to do the same for cars on foreign roads? It might make bunches of telegrams far thicker than an inch, and might necessitate decorating the office walls with a new variety of toy cars, or a map larger than any yet heard of; but would it not be money well spent? It would be necessary, of course, for each road to brush up its conscience—or to buy one—for to treat inquiries for cars as we sometimes treat tracers for small shipments of freight would be a costly farce. This individual treatment is a necessity, in the absence of an agreement with each important foreign road which regularly uses your cars; and it would no doubt be to a considerable extent necessary even with such agreements. There must at least be an agreement to maintain in working order the conscience before-mentioned, for asking for the return of cars which the holder desires to keep will often be a good deal like having a fight with a friend—a very unhappy situation all around. There will be need of all possible support to be had from formal agreements, and from free discussion between roads; that is, between officers possessing real executive authority on the respective roads. In personal conduct the practice of the golden rule may depend on conscience and vigor of will, but if a great corporation is to substitute the golden rule for the iron rule now prevailing—

the rule that possession constitutes enough "points of law" to justify any kind of act that may seem desirable—there will be need not only of the qualities just mentioned (in the officers) but need also of sufficient machinery to enable different officers and different companies to see, now and then, how the respective corporation consciences are working.

The bigness of the country and the value of freight cars must be recognized, and commensurate means taken to deal with this great problem of sending cars hundreds and thousands of miles away from home. The car service manager is in a situation somewhat analogous to that of a merchant doing business with many other establishments in a large city. To meet the demands of modern business, and to overcome the obstacles of time and distance that are imposed by the enlargement of the city, the telephone companies, at enormous expense, have put the merchant into almost instantaneous communication with all of the thousands of fellow business men with whom he may wish to communicate. There is some "lost motion" in this great machine, for the number of possible telephone connections is a hundred or a thousand times more than will ever be used by any one house. The railroad, with its telegraph, must provide for itself, over a million square miles, what the local business man has provided for him over 100 square miles. Make an estimate of what it would cost to keep as close track of your freight cars as is kept by the Pullman Company of its sleeping cars. We suspect that the figure would not be so frightful as is generally imagined.

NEW PUBLICATIONS.

La Locomotive Actuelle. By Maurice Demoulin. Paris: Librarie Polytechnique, 1906. 7½ x 11 in., 333 pages, 132 figures, 40 plates.

This volume is a general study of recent types of locomotives of high power, and is intended as a supplement to the Practical Treatise of the Locomotive Engine, by the same author, published in 1897. It owes its existence to the fact that since 1897 the locomotive has undergone a marked transformation, unique in its history, by which its power, stability and efficiency have been greatly improved. The book is intended to demonstrate that locomotives since their origin have been developed along lines laid down by necessity and circumstances, and this is brought out by the divisions of the subject. Examples of practice are given of locomotives in service in France, England, Belgium, Germany, Austro-Hungary, and the United States, to each of which a long chapter is devoted, while, grouped together, are those of Italy, Switzerland, Norway, Sweden, Spain, Portugal and Russia. In these chapters the merits of the various types are discussed and the service for which they are intended defined. The opening paragraph of each chapter is an introduction to the locomotive practice of the country and gives a brief outline of the tendency of that development and the results achieved. In the first two chapters there is a discussion of the general types of modern locomotives and the appliances, such as compounding and superheating, that have been introduced in order to increase the efficiency of the machine. These details are not only described in detail but are discussed from the standpoint of general effectiveness. The book stands, therefore, as a record of ten years of locomotive development and a register of current practice, bringing out, by the use of tables and other statistical data, the contrast between present conditions and those existing at the time of the appearance of the previous volume.

Railroad Legislation in Massachusetts.

The Massachusetts legislature was prorogued June 29. In the closing hours there was a struggle between the Senate and House over the "merger" legislation which had been attempted. A whole week was added to the length of the session on account of this one matter alone, which was made the subject of a special message by Governor Guild. The end of the struggle was a hopeless deadlock between the Senate and the House, and so the governor was compelled to prorogue them without accomplishing the slightest legislation upon the subject desired. Several bills were offered providing that the New York, New Haven & Hartford must not hold street railway securities in Massachusetts and must dispose of present holdings. One bill gave only six months for disposal of the holdings. President Mellen was the principal witness, and presented the case so as to produce a decided effect upon the committee. He asserted that he was law-abiding in his purpose toward Massachusetts. He believed that the holdings of street railways in Massachusetts by the Consolidated were legal; he had obtained legal opinion to that effect and had paid a high price for it. But he had no purpose to break the law, and if the legislature should simply pass a declaration that it was against the policy of the state to permit steam roads to hold electric railways, he would act upon that declaration and not hold them. He made some fun by naming two small roads which do not pay expenses and said that he could not get rid of them without going into bankruptcy. The committee, finally, after protracted discussion, reported unanimously a bill which directed the attorney general to take steps to learn whether the present holdings of the Consolidated are legal and in the meantime to prevent any further application of the merger policy. The radical members of the House tried to get around Mr. Mellen's influence, but conservatism developed and after two conference committees had found themselves unable to reach an agreement all effort was dropped and the legislature was prorogued, leaving the situation precisely as it was before the governor sent in his message.

Most important, aside from this, of the matters before the legislature was a complete codification and revision of the railroad and street railway laws. The codification became law just as reported by the committees, this report being the work, practically, of the recess committee which sat during the recess last year.

A bill was passed to give the railroad commissioners supervision of express companies which do business on railroads and railways. A resolve was passed, after opposition, for an investigation by the railroad commissioners into the use of chemical fire extinguishers by railroad companies. Similar agitation led to similar action for investigation regarding the introduction of block signals upon railroads and street railways, and a law was finally passed empowering the commissioners to order the introduction of block signals. A petition for a licensing board for railroad telegraphers was rejected.

Adverse action was taken on the petition for a law to regulate the loading of express, baggage and freight cars. Adverse action was taken on the proposition for more facilities for workingmen on morning and evening passenger trains in and out of Boston. The proposition that the people elect the railroad commissioners annually had no practical support. There was an effort to shorten the time permitted for the abolition of a grade crossing after the abolition had been adjudged necessary, but the effort failed, as it was thought that it was not wise to force abolitions faster than the means could be provided, and the state is already spending money for this purpose as fast as it can raise it. Legislation regarding the union station at Worcester is without practical consequence yet, because of the uncertainty, after many hearings by the special commission on the subject, where the new station shall be located. An adverse report was made on providing free passes for state and county officers.

Of importance to railroads is the enactment of the interurban electric railroad bill, which favors such enterprises as the Shaw line between Boston and Worcester. It had a strong majority in both the Senate and House. It permits such corporations to take private land by the right of eminent domain, just as a steam road may, and it proposes to facilitate electric lines between large cities, in competition with steam roads.

A bill has become law by which pupils of private schools are to be carried for half fare on the elevated and electric railways, same as the pupils of public schools. There was a claim that this bill was unconstitutional, but its friends took their chances, and the opposition thought it would be best to let the issue be settled in court.

The Senate has refused to revive the charter of E. Moody Boynton's bicycle railway from Boston to Fall River. The petition for municipal ownership of street railways came to nothing, and so did the petition for limiting the number of passengers in street cars. Leave to withdraw was the accepted report on the petition for limitation of the hours of street railway employees. The railroad commissioners are required to investigate regarding the use of lifting jacks, fenders and other means for protecting life and limb, and two of the three are now in Europe for that and other purposes.

Chicago Track Elevation in 1905 on the Pittsburg, Fort Wayne & Chicago.

For a number of years the Pennsylvania Company has been engaged in elevating its tracks in the city of Chicago. The methods employed during the past season are of interest on account of the height to which the tracks were raised and of the narrow space in which work had to be done.

The P., F. W. & C. right of way is hemmed in by the Chicago & Western Indiana right of way on the west and by Stewart avenue on the east, and is about 60 ft. wide, which space was occupied by four tracks (except for a short distance), and a retaining wall which had been built before any filling took place. During construction it was imperative that traffic should not be delayed, and it was, therefore, necessary that two tracks should always be kept in condition for regular traffic.

The ordinances for track elevation in the city of Chicago provide for the elevation of the P., F. W. & C. tracks, and the consequent elimination of all street crossings at grade from the south Branch bridge of the Chicago river to the Indiana state line, a distance of 12.39 miles, as shown in Fig. 1. Fig. 1 also shows the track elevation work done previous to 1905, that done during 1905 and the work remaining to be done.

It should be noted that the work between 47th and 55th streets included the elevation and entire rearrangement of a large yard as a

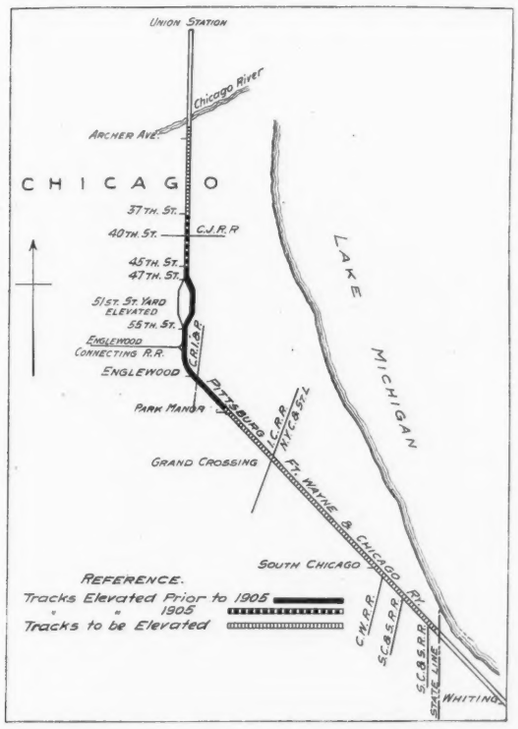


Fig. 1—P., F. W. & C. Ry. in Chicago.

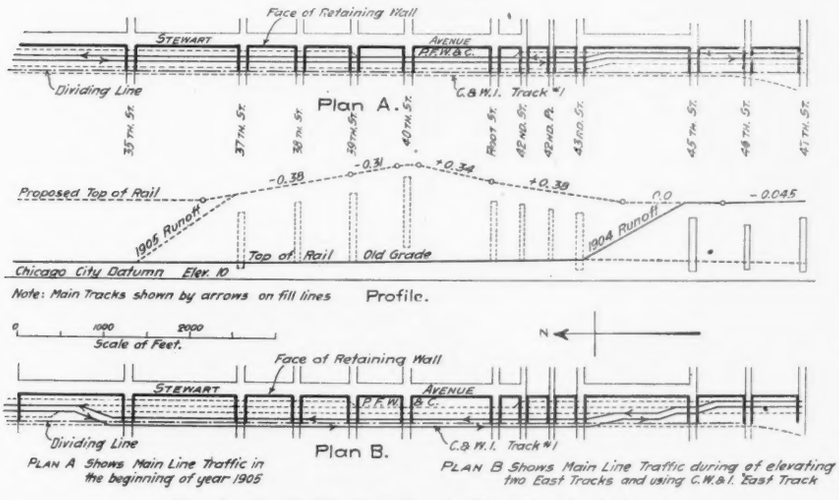


Fig. 2—P., F. W. & C. Track Elevation in Chicago.

Showing track arrangement before and during elevation of 1905. Profile of proposed elevated tracks with temporary run-offs.

gravity switching yard. This work was practically completed in 1904. At the close of the season in 1904 the tracks had been elevated from a point south of the Englewood station, at 63d street to 45th street, where a 1 per cent. run-off had been built to reach the old grade at 43d street. Thirty-fifth street is at present carried over the tracks on a steel viaduct, and is to be replaced by a subway. It was decided not to cut out this crossing in 1905 on account of risk of its remaining closed through the winter, and it was, therefore, decided to extend in 1905 the elevation work from 45th street to 37th street,

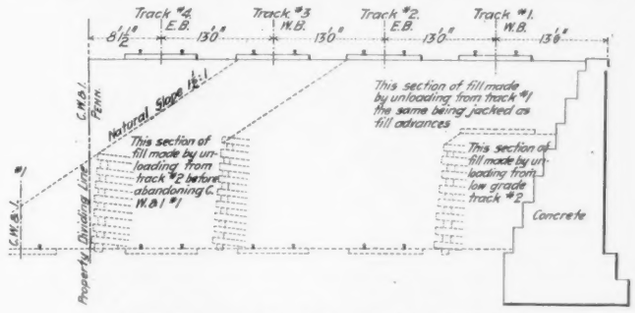

Track #4 E.B.
Track #3 W.B.
Track #2. E.B.
Track #1. W.B.
8½"
130"
C.W.&I. Penn
Natural Slope 1½:1
This section of fill made by unloading from track #1 the same being jacked as fill advances
This section of fill made by unloading from track #2 before abandoning C. W.&I. #1
This section of fill made by unloading from low grade track #2
Concrete
Property Dividing Line
C.W.&I. #1

Fig. 4—P., F. W. & C. Track Elevation.

Showing method of making fill.

with a run-off to 35th street. At 40th street the tracks are crossed by four tracks of the Chicago Junction Railway, and in order to abolish this grade crossing it was necessary to raise the P., F. W. & C. tracks about 23 ft. to provide the necessary clearance. This work is shown in detail in Fig. 2.

The grading, masonry, street work, trestles and the erection of the steel superstructures were performed by contract. All track work was done by the regular organization of the Maintenance of Way department, and a carpenter gang from the same department put in all stringers for abutment foundations, assisted in jacking up trestles as the grading progressed, and maintained all trestles under traffic. The regular track gangs were also used for building the crib-work for retaining the sand filling where needed.

The retaining will along the east right of way line was started in 1904, and this wall was built between street crossings from 43d street to 23d place, gaps being left wherever industrial sidings left the right of way, and in one or two places where there were right of way complications. At the same time foundations for abutments at street crossings were put in wherever possible, the tracks being carried on stringers during this construction.

Before starting work in 1905 an agreement was made with the Chicago & Western Indiana by which the Fort Wayne obtained the use of the easterly track of the C. & W. I. for the first part of the season, and in return that company obtained the use of two of the Fort Wayne tracks, later on, for an equal number of track days. Under this agreement the main line traffic of the Fort Wayne was diverted on May 18 to the westerly P., F. W. & C. track and the easterly C. & W. I. track, this traffic being then handled as

Fig. 5—Looking North from 40th Street, September, 1904.

Fig. 8—Looking North from 40th Street, August, 1905.

per plan B, Fig. 2, and three easterly tracks of the Fort Wayne were abandoned for constructive purposes.

At 40th street, through the courtesy of Mr. J. B. Cox, Chief Engineer, the Chicago Junction Railway operated across the rights of way of the P., F. W. & C. and C. & W. I. with two tracks during the period of elevation, and the north and south tracks of this company were abandoned and removed and the two center tracks spread to permit trestle bents being placed between them. As the work progressed, the wye connections to the Chicago Junction Railway were abandoned temporarily and traffic between the two companies handled via another route.

The material used for filling was sand similar to that used in other elevation work in Chicago. It was obtained about 22 miles out on the line of the Fort Wayne. It was loaded into ordinary gondola cars by steam shovel and unloaded entirely by hand.

Nearly all concrete was machine mixed, paddle machines being used.

In accordance with plan adopted for carrying on the work, no effort was made to build abutments (except foundations) or piers until after all tracks were raised, and temporary trestles were built at each street crossing, piles being driven to a depth of 6 to 8 ft. below the bottom of the proposed excavation for pier and abutment foundations. At crossings where street railway tracks were in service steel I-beams were used for spanning the tracks, thus avoiding the necessity for spreading them to clear a pile bent placed between them.

Fig. 3—Cribbing at 47th Street, North.

On account of narrow working space it was necessary to use cribbing to retain the sand slopes, and for this purpose a cribwork of old ties was built. With such a crib considerable sand drifted through, particularly on windy days, but the expense of keeping it cleared away from track next to the crib was very slight. The general character of this crib work is shown by Fig. 3.

As soon as tracks were abandoned for traffic piles were driven for half-height trestles on track 1 at all street crossings. Trestles were then framed up except in center, where two spans were left open for street traffic. Following the pile-driver, track 1 was torn up and removed, the crib work was built, sand was unloaded from track 2 to build the bank up to half-height, or as high as could be built by shoveling from a gondola car, and track 1 was then relaid on this bank. After completing the trestles on track 1, those for tracks 2 and 3 were built to full height, and these tracks were torn up and removed. Sand was next unloaded from track 1 at its new elevation, and this track was jacked to full elevation, the bridges being raised on extra caps as the track-raising progressed. This work was done in short stretches to avoid closing more than one or two streets at a time, and the work north and south of 40th street was carried on independently, as this crossing could not be blocked by a low-grade bridge.

Fig. 6—Looking North from 40th Street, June, 1905.

Having raised track 1 to full height throughout, a trestle was built across 40th street, and, using this track for unloading, the bank was widened for additional tracks, traffic being transferred from low track to high track, step by step, as the work progressed. Fig. 4 shows these various steps as carried out

The successive steps in the grading are also shown by the following illustrations: Fig. 5 shows the old grade crossing at 40th street and the wall north of it before grading was started. Fig. 6 shows conditions north of 40th street on June 29, 1905, No. 1 track relaid at half-height, Nos. 2 and 3 tracks in course of being removed, traffic on tracks Nos. 4 and 5 (C. & W. I. No. 1). Fig. 7

Fig. 7—Looking North from 40th Street, July, 1905.

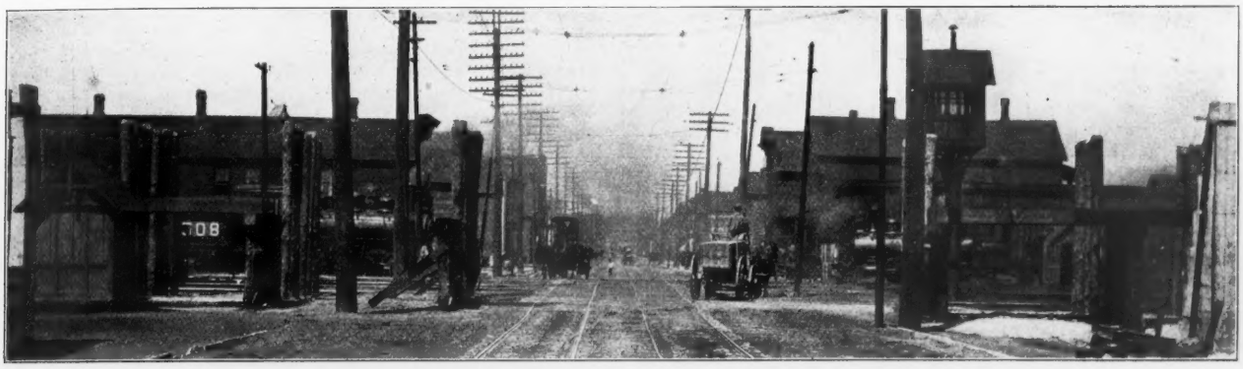


Fig. 9—Chicago Track Elevation—Root Street from the East, July 6, 1905.

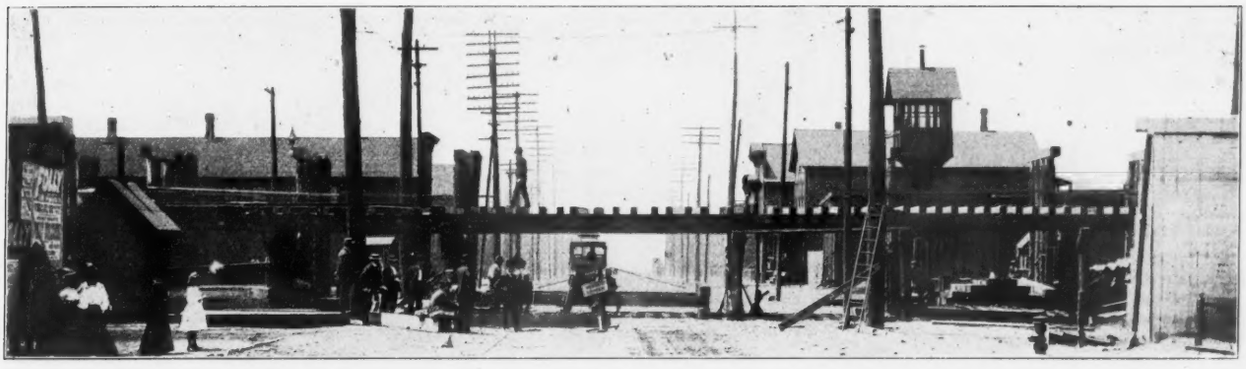


Fig. 10—Chicago Track Elevation—Root Street from the East, July 27, 1905.

Fig. 11—Chicago Track Elevation—Root Street from the East, August, 1905.

Fig. 12—Chicago Track Elevation—Root Street from the East, September, 1905.

shows conditions on July 20, No. 1 track raised to full height, Nos. 2 and 3 track spaces covered by fill, traffic on tracks Nos. 4 and 5 (C. & W. I. No. 1). Fig. 8 shows conditions on August 30, tracks Nos. 1 and 2 at full height, tracks Nos. 3 and 4 removed, traffic on tracks Nos. 1 and 5 (C. & W. I. No. 1).

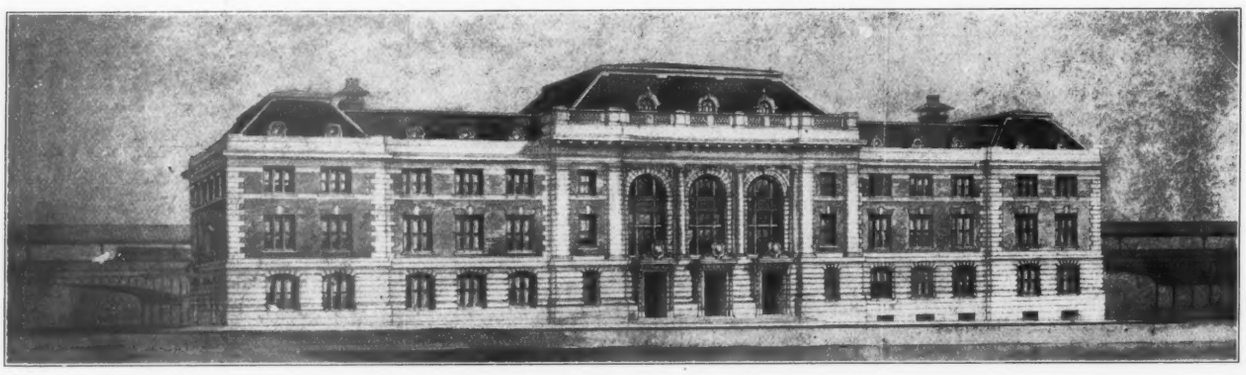
The successive steps followed out at the street crossings are shown by photographs taken at Root street, as follows: Fig. 9, taken July 6, shows the grade crossing, with piles driven for No. 1 bridge at half-height, and for No. 2 at full height. (Frame bents were used just north of the street car track account of electric conduits in the street at this point). Fig. 10, taken July 27, shows the street closed, floor system in place on No. 1 bridge, ready for track and just prior to jacking. Fig. 11, taken August 6, shows No. 1 bridge raised to full height on extra caps, and street open again to traffic. Fig. 12, taken September 28, shows crossing after completion of abutments.

All plans for the work were prepared in the office of the Chief Engineer of Maintenance of Way of the North-West System, Mr. R. Trimble, under general supervision of the Chief Engineer, Mr. Thos. Rodd.

The work was in the immediate charge of Mr. D. M. Craig, Assistant Engineer, from the office of the Chief Engineer of Maintenance of Way.

Proposed Baltimore & Ohio Station at Wheeling, W. Va.

Wheeling, W. Va., is the capital of the state and the junction of five lines of the Baltimore & Ohio Railroad. Extensive improvements are being made at this point, involving an expenditure of about $2,000,000. These include track elevation, bridges across Market and Chaplin streets and Wheeling creek, and new freight yards. They also include a new station, bids for which are to be received by July 16. A photograph of the proposed station is shown herewith. It will be a fireproof structure about 250 ft. long by 90 ft. wide and will have three stories and an attic. Because of the proximity of its site to Wheeling creek, it will have no basement, as any rooms below the ground level would probably be flooded during high water in the creek. For this reason a separate building is to be built for a power plant for heating, lighting and other power.



Proposed Baltimore & Ohio Station at Wheeling.

The design of the new station will be what might be called "American Renaissance." Mr. M. A. Long is the architect. The building will be used also for offices, but the station design will be preserved throughout. There will be a central pavilion, running east and west, with two side aisles connecting it to two smaller end pavilions. The principal or street front of the building will be to the north. To the south will be the tracks and elevated concourse. The tracks will pass the station on a level with the second floor. From the north, three massive doors protected by a bronze marquise will give entrance to the grand waiting room in the central pavilion. This room will be about 54 ft. wide by 82 ft. long and 30 ft. high. It will lead to the elevated concourse, which is to be reached by four large concrete stairways. These stairs will bring passengers between the east and westbound tracks, and will do away with the necessity of crossing the tracks. Two umbrella sheds, each about 500 ft. long, will be provided for protection of passengers while waiting for trains.

The exterior walls of the building will be dark, semi-vitrified rough brick laid in Flemish bond. The base up to the window-sill course will be faced with light gray granite and the remainder of the first story walls faced with Bedford limestone. Above the first story, all cornices and trimmings will be white terra cotta, colored to match the limestone. The interior framing of the building, including the roof, will be steel, with terra cotta tile floor arches and partitions and cinder concrete roof slabs, covered with green roofing tile.

The first floor construction will consist of a system of reinforced concrete beams, girders and floor slabs, and the entire structure will be carried on concrete foundations of an average depth of 8 ft. In the west part of the first floor will be the express rooms and offices, and in the east end, the baggage room and parcel check room. Opening into the general waiting room from the west side will be the women's waiting room and the smoking room. The rest of the floor will be divided into offices. The grand waiting room will be two stories in height; the remainder of the second and third floors being used for offices. Two passenger elevators will serve the three floors, and two freight elevators will run between the track level and the first floor, one for baggage, the other for express.

All waiting rooms and halls on the first floor will have floors of excaustic mosaic tile and wainscot of dark green veined marble. All wood finish throughout the building will be quartered white oak. The large waiting room will have a heavily beamed ceiling richly decorated with architectural detail, and laid off in 15 deep panels, in the center of each of which will be a 500 candle power electric light. In addition to these lights, each large pilaster at the sides of the room will have an electric torch of 500 candle power. The building will be heated by a vacuum system of exhaust steam. The plumbing fixtures will be of the best grade of vitrious porcelain. There will be two fireproof safety vaults in the station.

The power plant is to be across the street to the east of the station, and, while the design has been kept subservient to that of the station proper, it is similar. A large pit will be provided for accumulation of ashes from the boilers and a small pneumatic crane will load the ashes into cars by means of steel hopper buckets. The coal bins for the power house will be under the elevated tracks and can be filled directly from bottom dump cars. The plant will be laid out for a boiler capacity of 1,000 h.p., thus providing for all present needs and for future requirements as well. Over the engine room will be a small machine shop and storage, locker and toilet rooms, with shower baths for workmen. The chimney for the boilers will be 125 ft. high.

Foreign Railroad Notes.

The Simplon Tunnel was opened for regular traffic June 7. The passenger travel was heavy; but the trains were unable to keep to the timetable, and between Brieg and Milan the trains were nearly always behind time, sometimes as much as two hours.

Gen. A. A. von Wendrich, who brought order out of chaos on the Russian railroads during the famine of 1891, when he was given extraordinary powers, has been put in charge of the Siberian Railroad, which is said to very much need an executive of determined will and great capacity.

The successor of General von Budde as Prussian Minister of Public Works is Paul Breitenbach, since 1903 President of the Cologne railroad directory, and since 1878 in the state railroad service. He was educated as a lawyer, and served as a court officer and judge until his transfer to the railroad service. He is 56 years old.

In Germany conductors directing passengers to seats on their trains sometimes have a habit of "sizing up" the passenger by his appearance, and instead of asking "what class"? say "third class"? "first class"? or what seems to them the probable destination of a person of the dress and appearance before them—often to the disgust of the passenger. A gentleman with a package under his arm recently came in view of the conductor on the platform and was hailed "third class"? "No," says the passenger. "Fourth class then"? says the conductor. "No; fifth." "But there isn't any." "Well, first class then."

Types of Railroad Mortgages.*

The main purposes of railroad mortgage bond issues are to secure funds with which to build, complete, improve or equip railroad lines, extensions and branches, or all of these together. These debts fall due from time to time, and must be replaced by similar bond issues; for, with few exceptions, railroad companies no longer expect to pay off their debts. So that a new purpose arises and gives its name to the corresponding bond issue, namely, "refunding"; or perhaps a mortgage bearing some other name, as "general" or "consolidated," is made large enough to provide for this contingency, and kill two birds with one stone. Again, when a railroad company passes through a period of reorganization, and the claims of rival bondholders are adjusted, their holdings may be converted into one or more new mortgage issues, one of which may bear the name "adjustment" to indicate its purpose.

The multiplicity of bond issues may be said to be due to inelasticity in provisions of mortgages which secure them. The fact that a bond issue which is secured by a first mortgage on certain specific property cannot be increased when additional funds are needed, results in the creation of new mortgages with inferior lien. Of course, if the amount of a bond issue could be indefinitely increased at the will of the railroad company there would be no occasion or use for a mortgage to secure the debt. However, in recent mortgages, especially those which are created in times of railroad reorganization, more elastic provisions are included. An "adjustment" or "general" mortgage now, in addition to providing for the company's needs at the time of its creation, will provide a large amount of bonds, perhaps $50,000,000 or even $100,000,000, for various corporate needs which might arise in the future. Thus the corporation can secure funds for certain purposes without creating junior mortgages. At the same time extravagance is prevented and the interests of the bondholders safeguarded by specifying the purposes for which the proceeds of such bond sales may be used, and the rate at which they may be expended for these purposes. Thus a mortgage which provides $50,000,000 for future needs of the company may stipulate that this is to be used only at the rate of $2,000,000 a year, and only for making improvements and betterments.

The necessity of evading the lien of these mortgages upon property is also in part responsible for the second type, namely, the "collateral trust" mortgage. Here the security for the debt consists of corporate shares or bonds, or both. Since corporate shares represent control of, and bonds usually represent a first lien upon, property, the "collateral trust" mortgage may be said to be an indirect lien upon certain property, the nature or priority of the lien depending upon the kind of securities deposited as collateral. When a railroad company is adding to its system by purchasing control of the shares and bonds of connecting railroad companies, thereby obtaining control of their properties, it is easy to see the usefulness of the collateral trust mortgage as a financial instrument. If these shares and bonds were paid for out of the cash funds of the railroad company, that is, out of its earnings, the company and its stockholders would be deprived of the use of both the principal and interest of the purchase price, these losses being compensated by the income received upon the securities which were purchased and the benefit which the railroad company derives from the interchange of traffic with its newly acquired subsidiary company. If, however, these shares and bonds of the subsidiary companies can be paid for, not in cash but in collateral trust bonds, the railroad company obtains all these benefits and at the same time retains the use of its cash funds; practically its only expense is the interest which must be paid on the collateral trust bonds. This type of railroad mortgage is thus a device whereby to make property which is acquired pay its own purchase price, so to speak. It is a great economizer of capital funds. By means of this device E. H. Harriman, through the Railroad Securities Company, obtained control, in 1896, of $10,000,000 of the 5 per cent. stock of the Illinois Central Railroad Company with an outlay of less than $1,500,000 of the cash funds of his company, the purchase being "financed" by an issue of $10,000,000 collateral trust bonds bearing 4 per cent. interest. This device enabled Mr. Harriman to buy the shares he desired upon the margin principle, without subjecting himself to the dangers of ordinary purchases on margins.

Where a railroad is extending its lines into other states, these must be built by companies having charters under those states. If these companies were to depend on their own credit to bring them funds for construction purposes, their securities would command a very low price; for what guaranty has the prospective purchaser that one of these companies will be able to earn even the interest on its bonds? A large proportion of subsidiary companies do not. But if, instead of offering the securities of these subsidiary companies to the public, they be brought into the parent company's treasury and made the collateral security for an issue of the parent company's collateral trust bonds, the latter can be sold to much better advantage; for they are a direct obligation of the parent company of the system, and have the earning capacity of the entire system behind them.

In 1902, the Chicago, Rock Island & Pacific Railroad Company bought nearly all the stock of the old Chicago, Rock Island & Pacific Railway Company, financing the purchase in part by an issue of bonds secured by a mortgage on this stock; in the same year the old railroad company acquired most of the common and preferred stock of the Choctaw, Oklahoma & Gulf in exchange for another issue of bonds which were secured by a pledge of the stock acquired. In 1898 the New York Central acquired most of the stock of the Michigan Central, and in 1900 of the Lake Shore & Michigan Southern, in similar exchanges; and in 1901 the Great Northern and Northern Pacific together acquired the stock of the Chicago, Burlington & Quincy, financing the purchase by means of an issue of bonds which were the obligations of both companies and were secured by a deposit of the C., B. & Q. stock. The original holders of stock in all these cases exchanged dividend-paying shares for interest-bearing bonds, giving up their right to control the management of their companies for the right to receive a fixed rate of income. Although the stock they surrendered became the collateral security of the bonds they received in exchange, its voting power is in the hands of the purchasing company. Only in case of a default by the latter in payment of interest on the collateral trust bonds, could the holders of these bonds get possession of their old shares and their voting power.

In such cases the question arises, how are the interests of these bondholders to be safeguarded? Where their collateral consists of shares of stock, the parent railroad company may use the voting power which it thus holds to cause its subsidiary company to enter into traffic agreements with other railroad companies, which agreements may prove burdensome to the subsidiary company, drain away its earnings and undermine the security of the collateral trust bondholders. Or, if the parent company find itself pressed for funds, it may use its voting power in the stock of the subsidiary company to mortgage that company's property for all that it is worth; the lien of such a mortgage would come ahead of the claim represented by the subsidiary company's stock, and in event of default on the collateral trust bonds, should their holders foreclose their mortgage, they might find the stock they thus secured practically worthless because of the mortgage claims which had been placed ahead of it.

With a view to avoiding such contingencies, recent collateral trust mortgages contain provision intended to prevent the purchasing company from using its voting power in the stock of the subsidiary company for the purpose of placing any new mortgage or other claim ahead of that stock which is deposited as collateral, or to limit its power to do so. The collateral trust mortgage executed by the Chicago, Rock Island & Pacific Railway in acquiring the capital stock of the Choctaw, Oklahoma & Gulf, forbids the former company to exercise its voting power for the purpose of authorizing consolidation or merger of the "Choctaw" with any other company, or to authorize the sale of any of its property, or any lease of it save to the Rock Island itself, and even in that case the lease is to terminate in case the Rock Island should default in the payment of the interest upon its collateral trust bonds. The object of the last provision was to enable the collateral trust bondholders to obtain complete control of the "Choctaw" company should they foreclose their mortgage and obtain possession of the "Choctaw" stock—of course, this would be impossible if such a lease did not terminate when the Rock Island defaulted. The mortgage further provided that the Rock Island was not to use its voting power to authorize any new mortgage or bond issue by the "Choctaw" company, except its consolidated mortgage bonds, which were limited in amount to $30,000,000; nor to increase that company's capital stock until after May 1, 1904, or as soon thereafter as 95 per cent. of the old "Choctaw" stock had been deposited under this mortgage, and then only when a like proportion of the new stock had been similarly deposited.

Some of the older collateral trust mortgages required foreclosure of the mortgage before the trustee could get full control of the collateral. This often meant disastrous delays. Recent mortgages, among them the Rock Island mortgage just described, permit the trustee to at once assume the voting power of the stock which constitutes the collateral, and at his discretion, or at the direction of a certain proportion of the bondholders, to sell the collateral without foreclosure or to foreclose the mortgage and all the collateral at public auction. The mortgage created by the newly formed Chicago, Rock Island & Pacific Railroad in its purchase of the old Chicago, Rock Island & Pacific Railway stock, permits the trustee, in event of default, to sell the collateral either at public or private sale or on the Stock Exchange. In all cases of sale at auction, the bondholders have the right to bid in the collateral and pay for it with the bonds which they hold. For this purpose these bonds are worth their face value, no matter how low their market value may be, and therefore place their holders in a position of advantage in the bidding. By this means, shareholders who exchange their

*From a paper by Thomas W. Mitchell in the *Journal of Accountancy.*

stock for bonds, may, in the event of insolvency of the purchasing company, regain possession of their old stock and with it control of their company.

The terms of the mortgage created in 1898 by the New York Central and placed upon the Michigan Central stock, prevent consolidation in any manner of the latter company with any other without the consent of 75 per cent. in interest of the collateral trust bondholders, and provide that in event of the merger of the New York Central and Michigan Central, these bonds are to become a direct lien upon the Michigan Central property. In event of default, the trustee may sell the collateral as an entirety, or may foreclose the mortgage, or may bring a suit in equity to compel specific performance of its duties on the part of the New York Central. Finally, the New York Central cannot place any mortgage upon any substantial part of its property without including in it, in favor of each of these collateral trust bonds, "a lien and charge prior and superior to the lien in favor of any other bond or debt secured by such mortgage," except that the collateral trust bonds secured by a pledge of the Lake Shore & Michigan Southern stock are to go into such a mortgage on a basis of equality with these "Michigan Central Collateral" bonds. By these means it is attempted to prevent the impairment of the security of the collateral trust issues which are based upon deposits of corporate shares.

The third type of corporate instrument is at the basis of what are known as "Car Trust Certificates" or "Equipment Trust Bonds." The case may be put thus: A railroad company needs additional locomotives, freight cars and other kinds of rolling stock, and its surplus earnings are not sufficient for their purchase. How shall it finance the acquisition of this rolling stock? Several possible alternatives suggest themselves. New shares of stock might be sold with the advantage of not increasing fixed charges. Or perhaps there are general or consolidated mortgage bonds in the treasury, which may be sold and the proceeds used for this purpose; or the purchase of the new equipment may be financed by mortgaging this equipment and selling new bonds thus secured.

In practice, the last is never done. The actual procedure is this: A syndicate of capitalists is organized (a joint stock company being formed) to purchase the desired equipment from the manufacturers and pay for it. This equipment is then "leased" to the railroad company for a certain number of years, usually less than ten. The "rental" consists of three parts, viz.: (1) a certain cash sum which is payable at once, and which represents the syndicate's (or Car Trust Association's) expenses and profits; (2) a certain sum which really represents the purchase price of the equipment, and which is divided into a certain number of equal annual instalments; and (3) the true semi-annual rental of the equipment which takes the form of interest on the unpaid instalments of the purchase price. Some of these "leases" provide that title to the equipment is to pass, or a bill of sale given, to the railroad company upon receipt by the vendors of the last instalment of the rental. Such an instrument, it will at once be seen, although it speaks in the language of a lease is not truly such, for a genuine lease does not contemplate the eventual transfer of title to the property to the lessee. It really is merely a conditional sale of the rolling stock, the title remaining in the vendor until the last instalment of the purchase money is paid. Others provide that at the expiration of the "lease" the railroad company may purchase the rolling stock and receive title to it upon the further consideration of one dollar.

Finally, this "lease" is assigned to a trustee, and the railroad company issues its own "car trust certificates" or "equipment trust bonds," usually in amounts of $1,000 each, and divided into series maturing at dates to correspond with the annual instalments of the purchase money as provided in the "lease." These certificates or bonds, thus divided into series, represent the several instalments of the "rental" or purchase money, and the interest which they bear represents the true rental of the equipment or the interest on the purchase money. These certificates or bonds, after certification by the trustee of the "lease," are delivered to the syndicate of capitalists and eventually find their way into the hands of the investing public. Upon the complete redemption of the last of these bonds and the payment of all interest charges, and perhaps the payment of an additional one dollar, it is expected that title to the rolling stock will be assigned to the railroad company.

Further conditions of such an agreement are that each of this particular lot of cars or locomotives shall be plainly marked with the name of the "lessor," that they are to be kept in good repair and any which may be destroyed are to be replaced, by the railroad company, that once a year an accurate statement is to be made to the "lessor" as to the number in actual service, the number and description of those destroyed and replaced by others, that the "lessor" shall have the right to inspect his property once a year; that the railroad company will not assign or transfer its rights or interests in such equipment, nor underlet it without the consent of the "lessor"—the "lessor" having the right to terminate the "lease" in case of unauthorized sale or transfer of this property, a transfer by bankruptcy being deemed a breach of this covenant; that in case of default in the payment of any part of the "rental," or a failure on the part of the railroad company to keep the equipment in good condition, and so on, the "lessor" may terminate the lease, declare the principal of all series of the "car trust certificates" due, and enter into possession of his equipment. For this purpose the railroad company must deliver these cars at such points as are designated by the "lessor" or trustee, bringing them there at the ordinary speed of freight trains.

Here is an interesting point in which one of these instruments differs from a mortgage. In the case of foreclosure of a mortgage, the trustee would sell the property to the highest bidder, apply the proceeds to payment of the debt, and if any surplus remained this would be repaid to the railroad company. In other words, the mortgagor has an equity in mortgaged property. But in case of the "lease" or conditional sale, the railroad company has no such equity. Sometimes, indeed, the agreement expressly stipulates that the surplus proceeds or unsold equipment shall be returned to the railroad company; but in one such case the court held that the instrument was a mortgage, not a conditional sale, and because it contained this provision the purpose of this device was defeated. Recently equipment trust agreements have appeared which discard the language of the lease. The agreement securing the Equipment Bonds, Series "E," of the Chicago & Eastern Illinois in 1905 is a case in point.

The reasons assigned for using the conditional sale as a means of financing the purchase of equipment are various and conflicting. One reason assigned for use of this instrument rather than the purchase money mortgage, is that usually the property of such a railroad company is already covered by mortgages which contain what are known as "after-acquired property" clauses; that is, a provision to the effect that the mortgage is to cover certain specific property which is conveyed to the trustee, and also "all rolling stock, equipment, trucks, etc., now or hereafter acquired." Such mortgages, it is urged, would automatically extend over any equipment that might later be purchased, and any new mortgage that might be placed upon this equipment to secure the payment of the purchase money, would have merely an inferior lien. Of course, nobody wants a junior mortgage upon mere rolling stock. This sounds plausible, and where a railroad company buys rolling stock of one party, borrowing the funds with which to pay for it, and later attempts to fund the debt thus created by mortgaging this equipment, no doubt this idea has force. But the court has universally held that, where such rolling stock was purchased and a mortgage upon it given to the vendor to secure payment of the purchase money, the sale of the equipment to the railroad company and the giving of the mortgage were both parts of the same transaction, and although the lien of other mortgages did extend over this rolling stock, the lien of the new purchase money mortgage was superior to that of the old mortgages. Hence this objection is of no practical force.

A better idea, from the standpoint of the vendor, seems to be the difference between the mortgage and the conditional sale as to the equity of the railroad company in the rolling stock in the case of foreclosure sale. In the case of the mortgage, the surplus proceeds from the sale of the property, after satisfying the debt and incidental expenses, must be paid to the mortgagor. In the case of rolling stock bought by means of a mortgage, if all but the last instalment of the debt had been paid, this equity might be very large. But in a true conditional sale, this entire surplus may be retained by the vendor. With the latter instrument the vendor has the chance to make a considerable gain, compensating the risk he runs of netting an equal loss if the proceeds of the sale should fall short of the amount of unpaid purchase money. With the mortgage he runs the risk of loss without the compensating chance to gain.

The reason for making this conditional sale read in the language of a lease is another matter. According to the law of most states the conditional sale, although binding as between the parties thereto, is void and fraudulent as against the claims of a third party, a judgment creditor, a purchaser of the property without notice of the existence of this contract, and even with notice in some states. As a result, in case of insolvency of the railroad, the vendor of rolling stock under such an agreement might find it impossible to regain possession and title to such property. To avoid these difficulties, these instruments were made to speak as if they were leases and the consideration paid was the rental of the property. However, since title was to pass to the railroad company upon the payment of the last instalment of the "rental," the courts were quick to see that these were, in substance, mere conditional sales, and corporate ingenuity had to find a new device. This was accomplished by prescribing the additional payment of one dollar, after the payment of all rentals, as the consideration for the assignment of title, and, strange to say, the courts of Pennsylvania, which had been the principal stumbling block in regard to the theory of conditional sales, recognized this instrument as a true lease, the vendor's title being good against all claimants. This leaves the railroad company two methods of purchasing equipment without subjecting it to the prior lien of old mortgages, the purchase money mortgage, and the last-described form of the conditional sale or "lease."

The Pennsylvania Tunnels Under the East River.

There have been recently many rumors in the daily papers that the work of building the Pennsylvania tunnels under the East river to Long Island City was not progressing favorably and that on account of the serious obstacles which had been met some changes in the design and location of the tunnels or changes in the methods being employed for building them would be necessary before they could be completed. Through the courtesy of Mr. Alfred Noble, Chief Engineer for the railroad company, and Mr. E. W. Moir, of the firm of S. Pearson & Son, the contractors, we have been permitted to make a personal examination of the workings on both sides of the river and in this article some brief description will be given of the methods employed in driving the tunnels and the elaborate working plant of the contractors. It will also be shown on what little grounds the rumors of abandonment are based. For a full description of the project of the Pennsylvania Railroad to build tunnels under the North and East rivers with a terminal station on the Island of Manhattan the reader is referred to the *Railroad Gazette* of Jan. 16, Oct. 9, Oct. 16, 1903; Feb. 9, May 25, 1906. Only a brief description of the plans as related to the East river section will be necessary here.

Starting from the terminal station site at Seventh avenue, Thirty-first to Thirty-third streets, the station tracks will converge into two three-track tunnels, one under Thirty-second street, the other under Thirty-third street. Under the west line of Fifth avenue the three tracks of each tunnel converge into two and enter a twin-tunnel construction consisting of two tunnels formed in a single excavation. At Second avenue, the two lines are turned north slightly to shafts just east of First avenue. The shield-driven tunnels begin at these shafts, and thence the two tunnels will be entirely distinct across the river. The lines in the twin tunnels under Thirty-third street are known as lines A and B, and will be carried across under the river parallel to each other 37 ft. apart, center to center, and with approximately the same profile. The two lines under Thirty-second street, known as lines C and D, will likewise enter two separate tubes at the south shaft, and these two tubes will also be carried across under the river, converging toward lines A and B. The four subaqueous tubes pass through in two shafts just west of Front street, in Long Island City, and continue in approximately parallel tunnels up to East avenue about 2,000 ft. From East avenue out to Beech street the work will be cut and cover, and from Beech street to Thomson avenue will be open excavation. The tunnels between the Manhattan and Long Island shafts, with which we are particularly concerned, will be single-track tubes, with a cast-iron lining 1½ in. thick and 23 ft. outside diameter, surrounded with a thin sheet of grout and lined inside with 2 ft. of concrete. They will have an inside diameter of 19 ft. The concrete lining will be carried up on each side of the rails to form a bench 3 ft. 8 in. wide and 5 ft. 6 in. above the top of rail. In this bench will be inserted conduits for carrying telephone, lighting and power cables. Beginning at Fifth avenue, on the Manhattan side, the line descends on a 1.5 per cent. grade to a point about one-third the distance across the river, and from there begins to rise on a 1.25 per cent. grade to the open cut in Long Island City. The elevation of top of rail at the lowest point in the tunnel will be 8 ft. below mean high water. The total length of the subaqueous tunnel between shafts is approximately 3,900 ft.

The conditions of depth, character of soil, amount of cover over the top of the tunnel, etc., are perhaps the most difficult that have ever been encountered in similar work. The Blackwall tunnel under the Thames river, for which S. Pearson & Son were also the contractors, is generally considered to have been, up to the present time, the most trying work of this nature yet undertaken. The conditions confronting them in building the East river tunnels are perhaps even more difficult, but their experience in previous work is standing them in good stead.

The contract for building the tunnels was awarded them in March, 1904, and they immediately began active preparations for getting the work under way. An enormous plant of extensive and special machinery was required; in fact, this is the largest compressor plant in the world. Some idea of the size of the plant necessary may be had from the fact that for the Manhattan shafts alone a battery of six boilers was installed, having a total boiler horse-power of 3,000, or nearly 6,000 indicated horse-power available for the compressors. A more detailed description of the power house will be given in a subsequent issue. The work of sinking the shafts both in Manhattan and in Long Island City was begun early last year. A caisson 74 ft. 2½ in. by 40 ft. 2½ in. over the cutting edge was sunk over the line of tunnels A and B, and a similar caisson over the line of C and D. These caissons consisted of a rectangular steel shell with an inner shell, strongly braced together, and the intervening space, 4 ft. 11 in. wide, filled with concrete as the caissons were sunk. The plans provided for work under air pressure in case seamy or unsound rock was encountered at the lower levels. Circular diaphragms, 24 ft. 7 in. in diameter, were built in the sides to permit the starting of the shields through the caisson wall. The diaphragms were built up of ½-in. plate, supported by longitudinal plate girders, 3 ft. deep, riveted to lugs attached to the circular ring surrounding the opening. In both of the Manhattan shafts, however, solid rock was encountered when the cutting edge had been sunk about 50 ft, so that these diaphragms were not removed. Instead, the shields were erected at the bottom of the shafts on tunnel grade, those for lines C and D bing completed first. As the Manhattan shafts are used commonly by S. Pearson & Son, the contractors for the river section, and by the United Engineering & Contracting Company, contractors for the section westward from the shafts, a concrete bulkhead wall has been built in each of the shafts to a height of about 20 ft., in order that the working forces of the two contractors may not interfere with each other. Separate hoisting apparatus has been installed on each side of this bulkhead and the operations of both contractors are carried on entirely independently. As soon as the shields were erected and put in working order, headings were started out through the rock and the shields advanced far enough to put in a concrete bulkhead with three locks; two close to the floor level for passing men and material, and one under the roof for use as an emergency lock. The shaft for lines A and B was completed soon after the shaft for lines C and D, and as soon as possible the shields were erected and started out. The rock penetrated for the first 100 ft. or so was fairly solid in all of the tunnels, but the surface of the rock dips rapidly close to the bulkhead line, and before tunnel D had been advanced 200 feet, water-bearing sand and clay was encountered. At the present time line D has been advanced out beyond the pier head line about 600 ft. from the shaft. Line C is just emerging into the water-bearing material. Line B is out about 550 ft., and line A has not yet left fairly solid rock. So much for the progress already made on the Manhattan side.

On the Long Island side the work has been delayed somewhat owing to the fact that the caissons for the shafts have had to be sunk to their full depth because of the seamy character of the rock, which carries a considerable quantity of water. On the Manhattan side the shaft presents no novelties, for beyond the bulkheads and locks at the ends of the tunnels the methods employed for removing and hoisting material are substantially the same as would be used in any open excavation of a similar depth. In Long Island City, however, the caissons were sunk under air pressure for the last 30 or 40 ft. The caissons are substantially the same as those employed on the Manhattan side. They are 84 ft. 3¼ in. deep from the top to the bottom of the cutting edge, which is approximately 10 ft. below the level of the tunnel lining. Both caissons were sunk by the pneumatic process. After being sunk to a final depth, a concrete invert was laid under air pressure, and the roof of the working chamber then removed. The shields, air locks for the bulkhead, and similar parts, were lowered into the shaft in parts, and the shields assembled and completely erected in the shaft on the tunnel lines. After this was done the roof of the working chamber was again put on about 8 ft. above the diaphragm openings. A vertical steel shaft 6 ft. in diameter was carried up to the level of the dumping floor, about 18 ft. above the ground, and at the top another shaft about 6 ft. in diameter extending across in the form of a T was built on. An air lock about 10 ft. long was built in at each end of this cross shaft and a stuffing box for the hoisting cable put in immediately above the vertical shaft. Air pressure was then turned into the shaft and the space below the air-tight roof. After the air pressure had been put on, the shield diaphragms were removed. The air locks to go in the bulkhead were stored in slings under the floor. Several sections of the tunnel lining were put in place above the invert, starting with a bottom section near the back of the shaft and building up with successive rings until a complete ring was formed in the shield chamber, so as to give a bearing for the shield jacks when the shield was started out. At the present time the shaft for lines C and D is under pressure and both shields have been erected. A heading about 12 ft. square has been cut into the rock for a distance of 50 ft. ahead of the shield for line D, and work is being carried out on a similar heading for line C. Neither shield has left the shield chambers. The shaft for lines A and B has been sunk, the invert completed shields erected and the roof put on above the shield opening. The hoisting shaft and cross shaft at the top are about completed. Neither heading has been started, but work will be commenced as soon as the air locks are completed. In the C-D shaft a pressure of 18 lbs. is all that is required at present to keep out the water, and under this pressure only a small amount is coming in; so little that a 3-in. hose is ample to take care of the seepage. The rock is hard but full of small cracks, which bring in water quite freely.

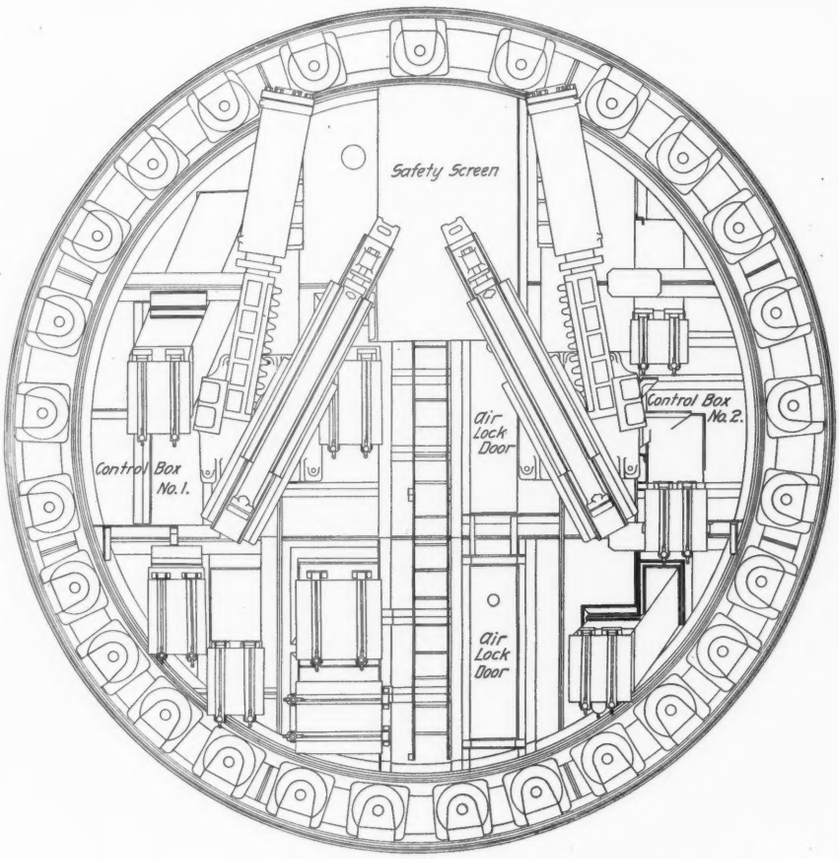
It was the original intention at Long Island City to start a shield for each tunnel from the shafts in opposite directions, one working out under the river and the other inshore. The caissons were built with this end in view. S. Pearson & Son, the contractors for the river section, also have the contract for the section about 2,000 ft. long extending from the shaft back to East avenue, and in order largely to avoid complication in working four shields

from the same shaft, they elected to begin work from a shaft sunk at East avenue, and to work west toward the river, rather than away from the river. The first 1,500 ft. of this work presented no difficulties, as the soil encountered did not carry water, but when a point about 300 ft. from the river shaft was reached, they had to abandon working without air pressure and have begun to make plans for using shields similar to the ones used under the river for carrying the four tunnels up to the river shafts. These shields will be erected in shield chambers cut out at the end of the present excavation. Bulkheads and air locks will be put in back of the shield chambers, and the work carried on in the usual manner. The point at which the shields will be started is close enough to the main power house to avoid any complications in the transmission of hydraulic pressure for the shields or air pressure for the tunnels.

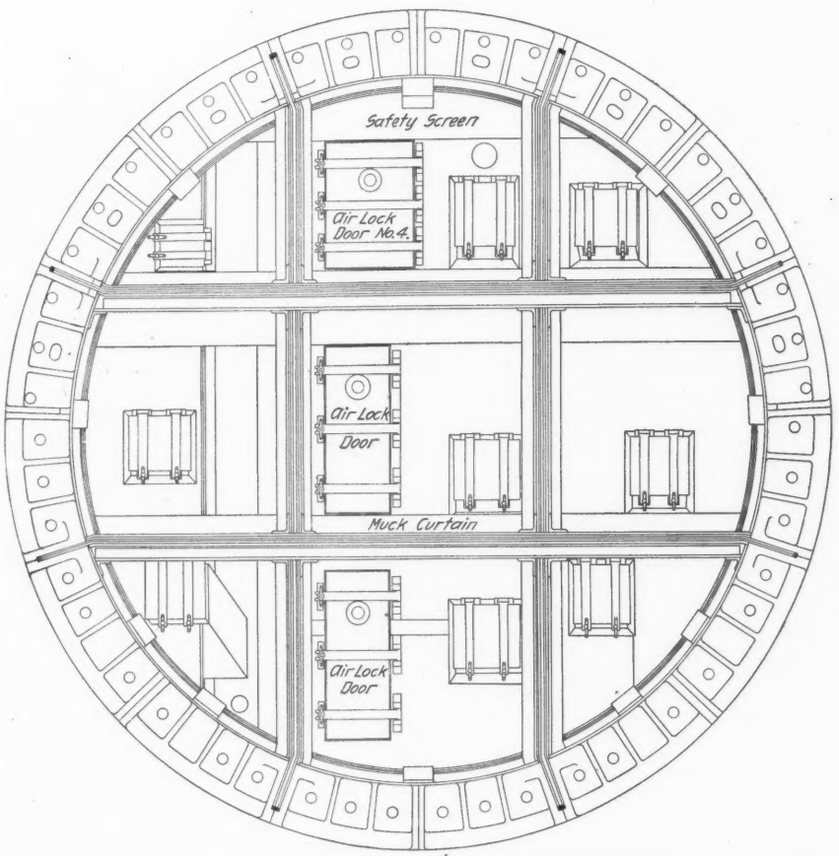
In a work of this kind the contractors' plant furnishes the most interesting details. S. Pearson & Son, contractors, have had, probably, more experience in tunnel building than any other firm in the world, and the completeness of their plant is remarkable. On the Manhattan side it accupies the entire space between Thirty-second and Thirty-third streets and First avenue and the river bulkhead line, and a considerable space north of Thirty-third street, and adjacent to the A-B shaft. An even larger area is occupied in Long Island City, where most of the material for use on both sides of the river is stored. The most important element of the working plant is, of course, the power house. A complete description of this will be given in a subsequent issue.

The shields used in driving the tunnels are similar in many of their essential details to the shields used by S. Pearson & Son in the Blacknall tunnel. They are 23 ft. 6½ in. outside diameter and 18 ft. long, built of steel plates and angles and fitted with a heavy cast steel cutting edge. Two central diaphragms 2 ft. 6 in. apart form an air lock between the face and the tail for use in case it is found necessary to employ a higher pressure in front of the shield than behind it. So far this has not been done. The working face is divided by two horizontal diaphragms into three floors and these are each divided by two vertical diaphragms into three chambers. On each of the three levels of the working face is an air lock for the passage of men and in each chamber is a muck chute extending down and back through the center air chamber with air tight doors at both ends. The accompanying drawings show the principal structural details of the shields and a more minute description is not necessary.

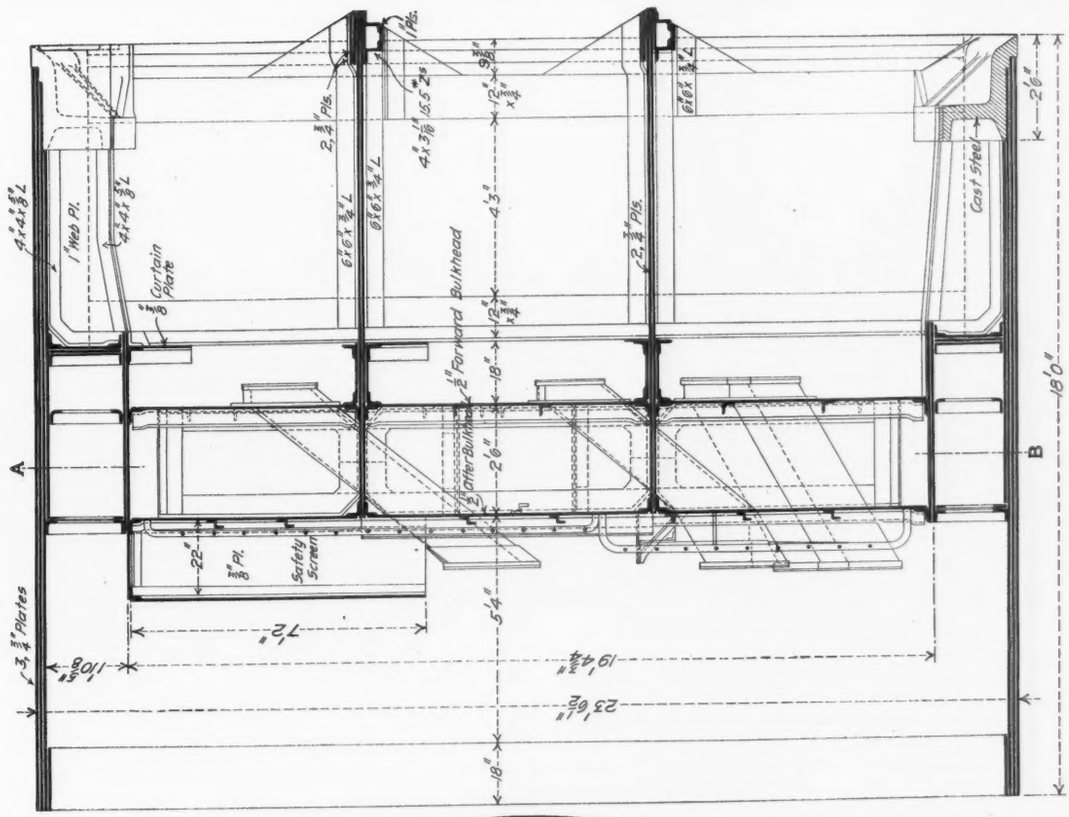
The shield is pushed forward by 27 hydraulic jacks 9 in. in diameter and 3 ft. 6 in. stroke. These jacks are spaced around shield between the outer shell and the central air chamber being massed closer together at the bottom. The forward end of each jack abuts against a continuous ring of three ⅝-in. plates, which is backed up by heavy webs extending to the back flange of the cast steel cutting edge. The pressure is thus transmitted directly to the cutting edge and the outer shell. Each jack has an area of about 60 sq. in. which gives a total pressure of 4,050 tons with a hydraulic pressure of 5,000 lbs. per sq. in. or 4,860 tons with a pressure of 6,000 lbs. per sq. in. The superficial area of the outer skin is 1331.28 sq. ft., which gives a maximum pressure of 3.75 tons per sq. ft. of skin area. The jacks are controlled in pairs by valves mounted in two control chambers in the after bulkhead. The valves for half the jacks are in the chamber on one side and

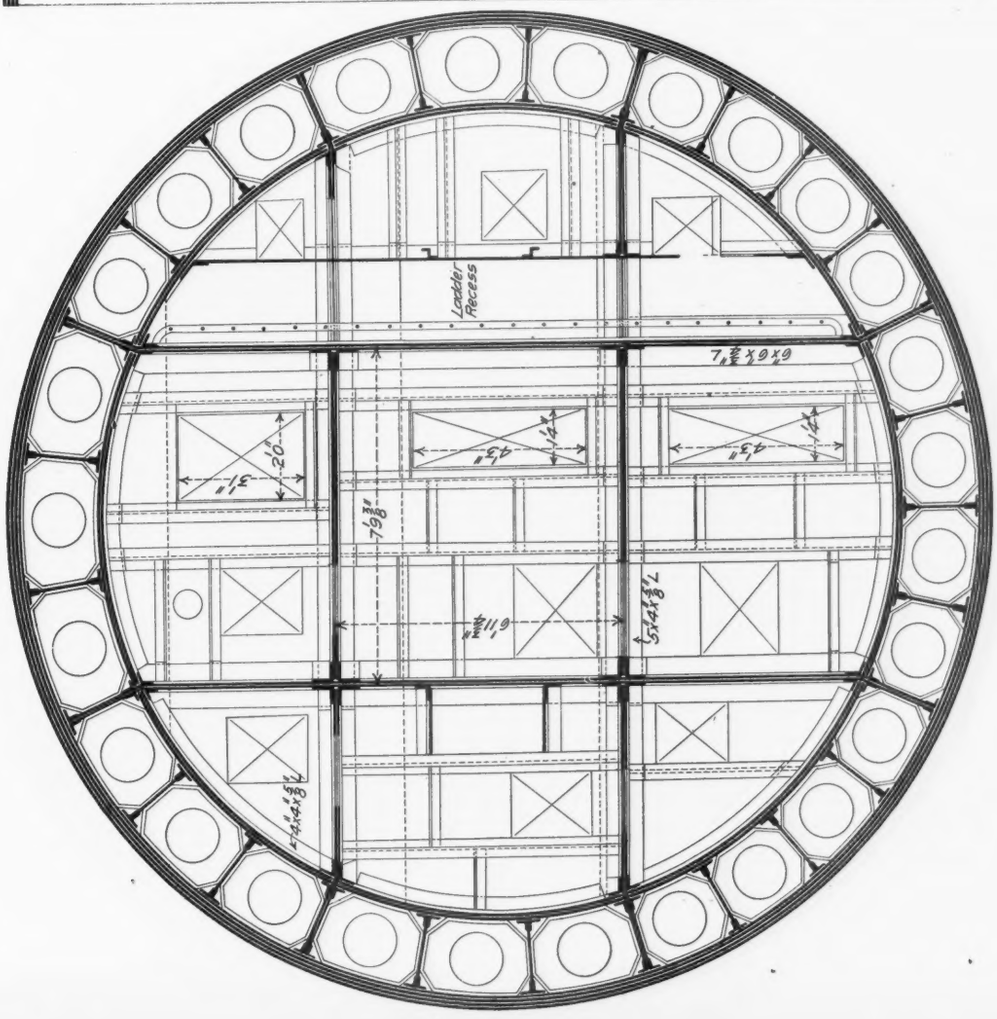


Back Elevation of Shield Showing Jacks and Hydraulic Erectors.



Front Elevation of Shield Showing Working Chambers.



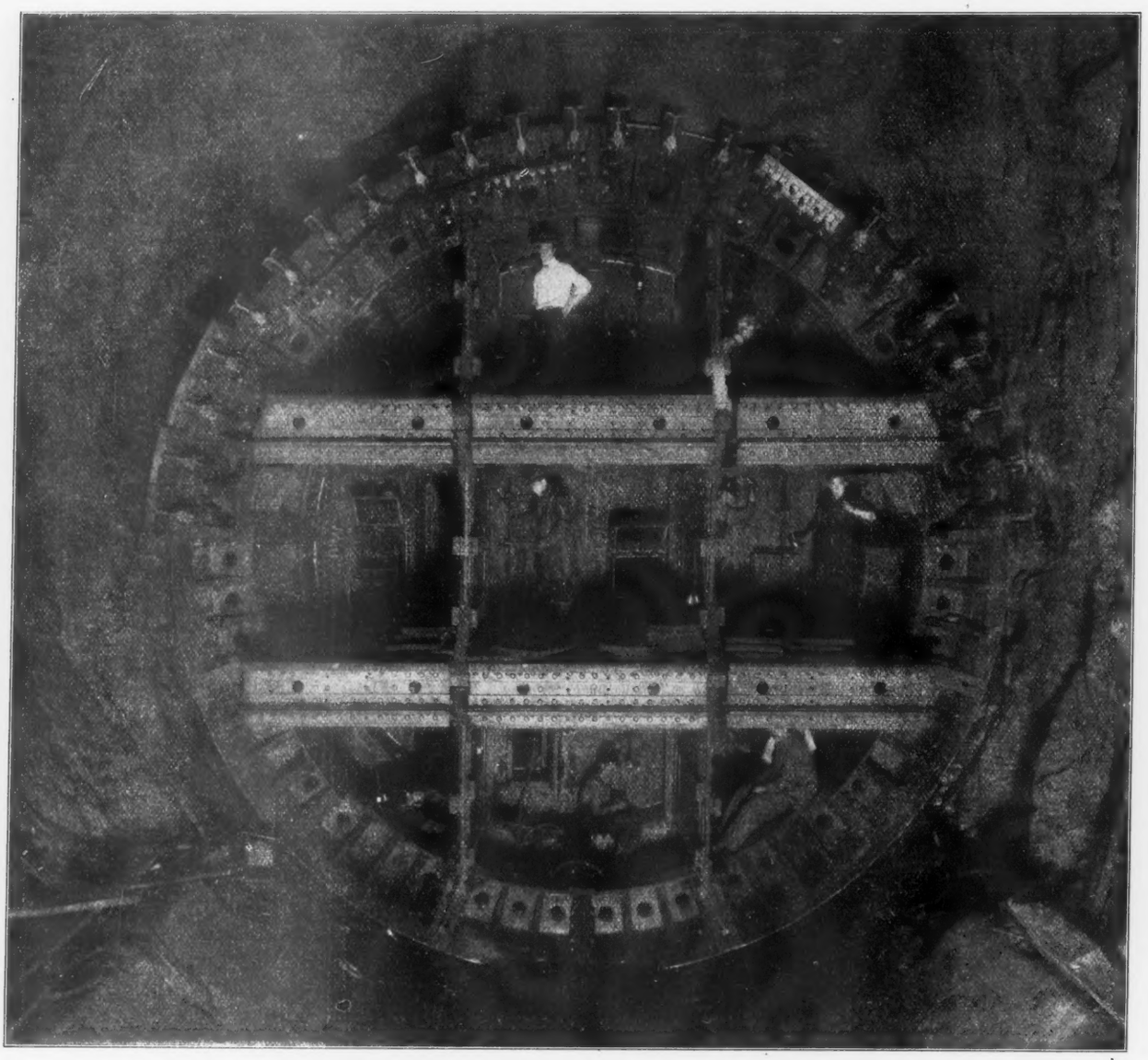


Section A-B.

Vertical and Cross-Sections of Shields for the East River Tunnels, Pennsylvania, New York & Long Island Railroad.

the valves for the other half are in the chamber on the other side.

Mounted on the after bulkhead are two hydraulic erectors for putting in place the iron lining segments. The erectors each consist of two hydraulic cylinders having movement only in a vertical plane. One cylinder is fixed in position near the top of the bulkhead and the piston is attached to a heavy cast rack. The other cylinder is pivoted on a revolving trunnion on which is a sleeve having a gear which engages with the rack on the first piston. The pivoted cylinder picks up the iron segments from the trucks on which they are wheeled out to the shield and the fixed cylinder revolves the pivoted cylinder carrying the segment into the proper radial position. The pivoted cylinder then pushes the segment home and the bolts are inserted, holding the ring in place. This is done under the protection of the tail of the shield. As soon as a complete ring has been erected the jacks move the shield forward and grouting is begun back of the tail of the shield over the completed ring. The erectors are handled from the control boxes on each side of bulkhead. A pressure of only 2,000 lbs. per sq. in., however, is used in the cylinders. The photograph of the rear of the shield snows the erectors and the control boxes.



Front View of the Shield in Rock, Showing Cast Steel Cutting Edge.

The arrangements for lifting the spoil from the bottom of the shafts and dumping it in scows in the river involve a large amount of trestle work of substantial character. The trestle work is built in two stories. On the upper floor is a runway or track for a locomotive crane, which extends out to the end of a pier just scuth of the Long Island ferry slips. This crane is used for loading and unloading scows moored to the pier. The hoists in the shaft, which are electrically driven, extend up to the upper floor, and the muck carts, which are run out through the material lock in the bulkhead in the bottom of the shaft, are run directly on to the hoist platform and lifted up to the top floor of the trestle. They are then run off on narrow-gage tracks, and with the aid of a switch back are run on to tipples, which turn them completely over and dump their contents into side-dump cars standing on a track below on the lower level. When one of these larger cars is filled it is hauled out to the end of the pier and dumped into a waiting scow. The spoil is being deposited at the Greenville yards of the Pennsylvania, in lower New York Bay. A system of continuous rope haulage is in operation between the bulkhead at the shaft mouth and the heading in each tunnel. On account of the air pressures employed, no draft animals are allowed in the tunnels.

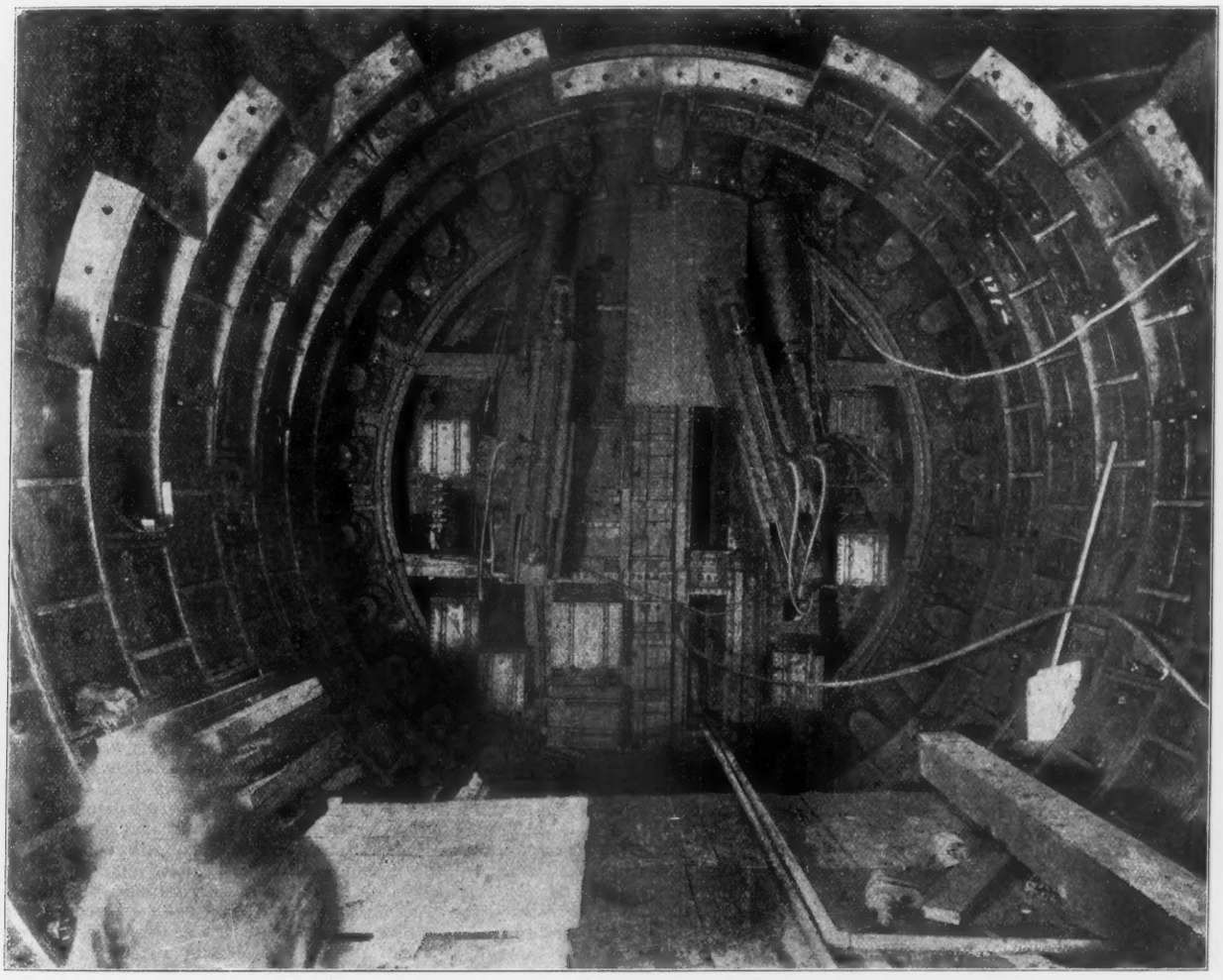
The United Engineering & Contracting Company, which is working west from the same shafts, also has an extensive plant for the removal of the spoil from the tunnels. They use an overhead telpherage system by which the loaded trucks run out of the tunnel mouth, are picked up by the telpher hoists, and when above ground are transported to a dumping hopper, under which carts are placed for removing the excavated material to scows moored to nearby piers.

Experience has shown that in work under compressed air, especially at the depths and pressures employed in these tunnels, there is certain to be a good deal of trouble with the "bends," or caisson disease, no matter how carefully the workmen are examined and cared for while at work. Very complete arrangements have been provided on both sides of the river for giving immediate attention and medical aid to any men overcome or injured in any way. As a part of the working plant at both the Manhattan and Long Island shafts the contractors have provided a completely

equipped emergency hospital and three medical air locks for the treatment of persons affected with the bends, under an equalized air pressure. The medical staff consists of a supervising medical director and four other physicians, one of whom is always on duty during the twenty-four hours. The medical quarters consist of a waiting room for applicants for work, all of whom are required to undergo a thorough medical examination before being allowed to enter compressed air, and an examination room which may be utilized as an emergency hospital. The physician in attendance is constantly employed examining applicants for work, and each man, if passed by the doctor, is given a numbered badge, without which he is not permitted under any circumstances to enter the workings. All of the men are periodically examined at frequent intervals to see that they are in a good state of health. Just off from the examiner's office is the air lock room, containing two medical locks, or caissons. These caissons are about 20 ft. long and 7 ft. inside diameter, and are built with an intermediate chamber at the outer end. The rear chamber contains two cots, one on each side, and mounted on the back wall are an air pressure gage, a thermometer, and a clock. A person afflicted with the bends is immediately taken to one of these locks and placed on one of the beds if in extreme pain. The inner door is closed and the attending physician raises the air pressure in the lock to a point where the patient feels some relief. By thorough massage the pain is soon relieved, if the case is not a serious one, and the air pressure at the same time is very gradually lowered to that of the surrounding atmosphere. In case a number of men are affected at one time, two can be put in the inner chamber of one air lock and two in the inner chamber of the other air lock, and by means of the outer chamber with the double doors the attending physician can leave one lock and enter the other without reducing the pressure in either. Ventilation is provided for by an automatic ventilating valve and by a positive ventilating valve, which can be used in case the automatic valve does not supply sufficient air. A bathtub is placed conveniently near the locks, so that a patient may be given a hot bath, if necessary. These two locks are for the use of the men employed by the contractor. A similar lock is placed in the quarters provided for the engineers and inspectors of the railroad company. These medical locks have been found to be of great value in giving immediate treatment for caisson disease. They were first used on the Hudson Company's tunnel under the North river, when S. Pearson & Son undertook that job in 1900, although they had been suggested before that time.

The quarters for the workmen are large and light and are kept scrupulously clean. Each man is provided with a locker for his clothes. These lockers are made of sheet iron and are built in rows placed back to back in the center of each dressing room. Under each bank of lockers along the floor steam pipes are carried, and the floors of the lockers are perforated, as are also the tops. Steam is kept on these pipes at all times, and the current of warm, dry air rising through the lockers soon dries out wet clothes and insures that the men will have warm, dry clothing before going into the workings, and that their street clothes will be warm and dry when they come out. Ample toilet facilities are provided, and each dressing room has in connection with it a wash room, with a number of shower baths, having hot and cold water. These rooms are all on the second floor of the staging above ground, and are connected with the top of the hoists, where the men come out of the shaft, by a covered passage way, so that they will not be exposed to drafts. The dressing room for the railroad company's engineers and inspectors is off in another part of the grounds from the workmen's quarters, and it is provided with every convenience also. Each man has a separate metal locker, also provided with steam-drying apparatus underneath, and a large washroom is connected with the dressing room.

On the Long Island side substantially the same arrangements for the care of the men have been provided, but up to this time a much smaller force has been employed and the air pressure has been much less in the workings, so that a physician is not kept in attendance on that side of the river, nor are applicants examined there. All men applying there are sent to the Manhattan side for examination. The same arrangement of hospital locks, however, has been



Rear View of Shield, Showing Erectors and Iron Tunnel Lining in Place.

provided, and the workingmen's quarters are practically a duplicate of those on the Manhattan side. Taken as a whole, the arrangements for the comfort and safety of the men provided by the contractors on this work are the most complete which the writer has ever seen, and certainly nothing more could be asked for on the part of the employers for the welfare of their men, so far as it is within their power to provide it.

From 30 to 45 men are employed in each heading during the entire 24 hours. Sunday work is carried on every other Sunday. They work six hours a day in two shifts of three hours on, three hours off, and three hours on, in pressures above 32 lbs. per sq. in., and 8-hour shifts below this pressure. The wages paid are about double the prevailing rate for similar work above ground. The common laborers, or "sand hogs," have been getting $3 a day, and the various classes of skilled labor correspondingly high wages. The conditions under which the men work are trying, and of course there is always present an element of danger, but every effort has been made to reduce the discomforts and danger to a minimum. The temperature in the headings is close to 88 deg. Fahr., and this cannot be materially reduced. The enormous volume of compressed air being forced into the tunnel enters at a comparatively high temperature, despite the use of the most efficient after coolers, and when grouting is going on back of the shield, the chemical action of the solidifying mixture of cement causes a marked rise in temperature. The inside of the iron tunnel lining is often so hot that the hand cannot be held against it. The ventilation, however, is excellent. About 5,000 cu. ft. of air per minute is being forced into each heading. With 30 men at work this is an average of 10,000 cu. ft. of air per man per hour, or ten times as much as is considered necessary for good ventilation. The air intakes of the compressors are above the roof of the power house, and the free air thus obtained is as pure as can be had. Any dust or foreign matter contained in it is filtered out in the process of compressing and passing through the after coolers. The pressure employed is 32 lbs. to 34 lbs at present.

In spite of all these precautions and safeguards there have been 14 deaths from "bends." This may be explained partly by the fact that the class of labor obtainable has been low, and that in the face of constant warnings and careful watching on the part of the foremen, the men persist in taking reckless and foolhardy chances on coming out of the compressed air. A competent lock tender is in charge of the man lock at the foot of the shaft and he has control of the speed with which the air is admitted or exhausted from the lock. Occasionally, however, a man will be in a hurry to come out and will come through the mud lock with a rapid reduction in pressure. A case of "bends" more or less severe is almost sure to result if a man is green at the work, though some of the old hands much prefer to come out quickly, saying that slow de-compression forces their "bends." Only recently two men came out after their first shift and immediately went into a neighboring saloon to quench their thirst. A large bucket of ice-cold beer caused an immediate attack of "bends." The contractors cannot be held responsible for the actions of their men when off duty, and it would be obviously impossible to attempt to examine each man every time he went down. So far as analysis will show, the air supplied in the tunnels is pure and very low in carbonic acid. No peculiarity of the soil through which the tunnels are being driven has been found which would account for any bad effects on the men working there thus far.

We come now to some of the difficulties which have been encountetred on the work and the methods employed for overcoming them. As was stated in the beginning, perhaps no more difficult piece of submarine tunneling has ever been attempted than this work. The contour of the bottom of the East river, the character of the soil underlying it, together with the limit of depth imposed by the maximum air pressure which could be employed, and the maximum grade permissible in the tunnel approaches, all combine to impede rapid progress. The contour of the bottom of the East river is somewhat peculiar. The strata of solid rock—mica schist—which underlies practically the whole of New York City, extends out about to the bulkhead line on the Manhattan side, at the level at which the tunnels are being driven. The depth of water increases rapidly from the shore out to the deepest point, about 300 feet beyond the pierhead line, where it is about 58 ft. deep. About the center of the river is a ledge of rock which comes up to within 35 ft. of the surface. This ledge of rock is a submerged extension of the same ledge which forms Blackwell's Island, about three-quarters of a mile up-stream. The rock begins to come close to the river bottom again near the Long Island shore. Between this rock ridge and the pierhead line on each side are two deep pockets of very fine water-bearing sand, or quicksand, which, while it compacts to almost the solidity of rock when confined, is about as difficult a material to drive a shield through as could be found. There have been encountered thin strata of hard, well-compacted clay, running through the quicksand. The air works through the quicksand under the strata, and often some 200 or 300 ft. in front of the shield before it breaks through and comes to the surface. At the deepest point in the river the tops of the tunnels are only about 10 ft. below the normal bed of the river, and this 10 ft. is quicksand mixed with some mud. It was, of course, necessary to add some cover at this point, and permission was obtained to deposit a clay blanket to a depth not exceeding a minimum depth of the river at low water of 27 ft. This gave a blanket about 18 ft. thick, or 25 ft. of cover over the shield. When lines B and D had progressed out into the sand, work was begun on depositing this blanket from dumping barges and dredging. The current in the East river is quite strong, running four miles an hour at maximum tides; but little if any clay has been found to have scoured away. A mat about 350 ft. wide has been deposited over this hollow in the river bed, and so far has proved very effective. The principal difficulty in the work has been to prevent blow-outs over the top of the shield. The problem has been to maintain such an air pressure as could be retained under the top of the shield and at the same time would keep out most of the water at the bottom. The diameter of the shield corresponds to a difference in head of 10 lbs. air pressure between the top and the bottom. At mean high water the pressure at the bottom of the shield, when the shield has reached its lowest elevation, would correspond to about 41 lbs. An excess pressure of 10 lbs. at the top of the shield would, of course, cause frequent blow-outs. The method of determining the pressure to be used in the heading has been to disregard the lower half, roughly, of the diameter of the shield and to equalize the pressure to correspond to the elevation of the center or a little lower. This pressure is, of course, varied according to circumstances and the judgment of the foreman in the heading. At the present time, in the heading for line D, a pressure of 32 lbs. above atmospheric pressure is being used. With this pressure there is, of course, some little inflow of water at the bottom of the shield, but with the pumping apparatus in the shaft this is easily taken care of. The water is forced back out of the tunnel through the bulkhead at the shaft by the air pressure in the heading, and is pumped from a pump to the surface. When working in this soft material, the great weight of the shield, which is something over 250 tons, would naturally cause a constant sinking of the heading in such material as described. This is compensated for by tilting the shield upward at all times, the difference in the movement of the jacks at top and bottom being at times as great as 5 to 8 in. No difficulty has been experienced in maintaining the level of the tunnel at the heading, nor has any sinking of the completed portion back of the shield been observed. Advancing the shield in the quicksand has proved to be a rather difficult task. On account of its great weight it has been considered unsafe to jet in front of it, and, as the difficulty of driving piles in quicksand without the use of a water jet is well known, it will be appreciated what the difficulties are in attempting to force forward such a ponderous mass as the shield. Normally, a pressure of about 5,000 lbs. per square inch is used in the traversing jacks, but at times this has had to be increased to 5,500 lbs. per square inch. At these pressures considerable difficulty has been experienced with the packing in the jacks. It is believed that this is principally due to the presence of the fine quicksand which finds its way into every crevice in the workings. Under the enormous pressures employed, this sand will quickly cut out almost any kind of packing which can be employed. Its action is very peculiar. Some specimens of copper piping cut completely through in three or four hours by the erosion of the sand were shown to the writer. A small leak at a union in the pipe which was buried in the sand in the bottom of the tunnel had evidently produced a swirling action around the joint, and the sand stirred up by the small stream so formed had cut away the 3/16-in. copper pipe from the outside, leaving it with much the same appearance as if it had been held on the edge of an emery wheel. The tremendous power of the hydraulic pressure employed will perhaps be best appreciated if the pressure is stated in terms of head of water in feet. The head is approximately 12,000 ft.

The method employed in mucking through the quicksand is interesting. The face of the shield is closed with shutters provided with small sliding doors through which the material is excavated, and which are normally kept open. The quicksand, of course, has an angle of repose of practically zero and will not permit excavating from the top. It is worked back through the shield through these doors and loaded on trucks, and the shield is slowly worked forward to keep up with the amount taken out from in front of it. No attempt is made to excavate a heading and then advance the shield into the heading. There have been a number of blow-outs which have temporarily delayed the work, and one caused some loss of life. On the 22d of June a blow-out occurred which flooded the completed portion of the tunnel partially and drowned two of the men working in the heading of line D. This blow-out was no more serious than a number which have occurred, but the men who were drowned were standing in the lower part of the shield, and one was not able to extricate himself and escape, being caught by his shovel. He kept another man behind him although all of the other men in the heading had ample time to reach the air locks and come to the surface. The blow-out delayed the work less than 24 hours. In that time the tunnel was pumped out and

work was again begun at the heading, after the bodies of the two men were removed. It was an accident which was liable to occur in any mining work through such treacherous ground, and one for which no one could be held responsible. Provision is made in the heading for stopping blow-outs, with bundles of hay and sand bags, and these have been effective in most cases.

The four tunnels on the Manhattan side pass under the Long Island Railroad ferry house and slips, and some settlement has occurred on the surface, which is noticeable but not dangerous. The ferry house rests on piles in made ground, and the brick walls of the building have cracked in places. Since the headings have advanced beyond the bulkhead line, however, no further settlement has been observed. The floor of the outer concourse has sunk 6 or 8 in. over the tube B, and the south ferry slip, which is directly over line D, has been temporarily abandoned on account of the pile fender sinking in the center and tilting badly. Work is now going on pulling these piles and redriving them. The river bed has settled firmly over the completed part of line D, and the damage done is only temporary. Over the shields for lines B and D the boil of escaping air is impressive, but not indicative of any danger. The immense volumes of air supplied to the headings escapes under the hood and tail of the shield, and works up to the surface in the form of a miniature geyser, but the disturbance in the river bed is purely local, and as the work proceeds outward the sand in the bottom settles and compacts as hard as before.

On the Long Island side the excavation is still in rock. The method employed may be of interest. After the shield has been erected and started out beyond the caisson the heading is driven out about 50 ft. This heading is about 12 ft. square and level with the bottom of the shield. The method of blasting the first heading is briefly as follows: Two vertical rows of holes about 4 ft. apart are driven in the face, tapering toward the center line. A top row of holes is then drilled, tapering downward. After these have been drilled other rows are drilled parallel to them, but tapering toward the center somewhat less, up both sides and across the top, until the approximate size of the heading has been reached. The center core, consisting of the two inner vertical rows and the lowest top row, is shot first, and the sides and top are then shot in afterward. The explosive used is transite, which is powerful and gives off little noxious fumes. As soon as the holes have been shot the mucking begins, and as soon as possible after the rock is cleared away from the face of the heading the drills are put to work again. After the heading has been advanced about 50 ft., drilling is begun from the first and second platforms on the shield and the rock shot down. As fast as this work proceeds the shield is advanced and successive tunnel rings put in behind it.

An effort is being made by all concerned to have the work finished as soon as possible, but it is not expected that it will be done in less than two years, and if unforeseen difficulties are met it may take much longer. The progress being made is quite satisfactory, however, and is as much as the engineers and contractors estimated on. An average of about 5 ft. in twenty-four hours is being completed in the work through quicksand on line D, and work on the other tunnels is progressing satisfactorily. If this rate can be maintained on both sides of the river, line D should be completed in 350 working days, and the other tunnels in a corresponding time. There is no reason to believe that any change will have to be made in the plans as they now stand. An experimental shaft was put down last summer at the foot of Thirty-fifth street and the test begun of the freezing process. A heading 7 ft. 6 in. in diameter has been driven out into the river and freezing has been going on continuously for about ten months.

(To be continued.)

Canadian Railroad Expansion.

BY S. J. M'LEAN.
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Mr. J. J. Hill's plans to participate in the expanding traffic of the Canadian Northwest are the most recent tribute to the traffic importance of a section which, 30 years ago, was known as the "great lone land." Mr. Hill's recognition of the traffic possibilities of the Canadian West is not limited to the prairie section alone. In British Columbia he has in hand the Vancouver, Victoria & Eastern, which runs through the mineralized belt of southern British Columbia. This will open up a more direct line of communication between the British Columbian seaports and the Crow's Nest region and will undoubtedly have important effects on rates throughout the Rocky Mountain section. Already the result of this activity has been to force the Canadian Pacific to undertake the construction of a line from its main line at Spence's Bridge into the boundary country. The extension of the Hill road to Fernie will tap the coking coal, which is in demand further west in the mining country which the road traverses. A branch of the Vancouver, Westminster & Yukon, another Hill project, is to be extended to Edmonton by way of Yellow Head Pass. Other lines projected will enable him to tap the agricultural section both of British Columbia and of southern Alberta. In the new provinces of Alberta and Saskatchewan Mr. Hill proposes to build a line from Fernie, running north of the Canadian Pacific, and eastward through Manitoba to Winnipeg. It is not Mr. Hill's policy to build east of the lakes, and he has expressed his willingness to have the Canadian lines handle any of his Canadian traffic east of Winnipeg. The ramifications of his American lines are such, however, that it is probable that, with the exception of distinctly local traffic, the bulk of the traffic he obtains will go south of the boundary.

In the development of the Canadian railroad systems, stress has been laid on the development of transcontinental lines, not transcontinental lines in the American sense, but lines stretching from ocean to ocean. The lines have been and are being built with the idea of developing an east and west traffic. The charter of the Canadian Pacific was intended to force the traffic of the Northwest over an all-Canadian line to the seaboard. Although the protest of Manitoba led to the abrogation of this provision this phase of policy is still to be met. At present there is opposition in Parliament to Mr. Hill's projects in the west on the ground that they are intended to divert Canadian traffic to Seattle. The three great Canadian systems—the Canadian Pacific, the Canadian Northern and the Grand Trunk—have each adopted the ideal of a line stretching from ocean to ocean. The Canadian Northern will ultimately reach the Pacific; on the east it has provision for a terminus in Nova Scotia. When the Grand Trunk obtained the charter for the Grand Trunk Pacific and undertook to enter the Northwest it endeavored to repair an earlier error of judgment. For before the Canadian Pacific syndicate was formed, the Grand Trunk was asked to build the line. It refused because it could not see any traffic advantages in such construction. One of the leading advantages urged by the Canadian government in favor of the Grand Trunk Pacific legislation was that it would give an east and west line on Canadian territory and make Canada independent of the bonding system. There was granted by Parliament at its recent session the incorporation of the Grand Trunk Pacific Branch Lines Company. This charter gives blanket powers to build branches from Halifax on the east to Victoria and Dawson on the west. But while there is favor shown to all-Canadian lines, both British Columbia and Manitoba are desirous of obtaining additional facilities from any source. It is probable that the new provinces of the Northwest will adopt the same attitude.

At present the Canadian Pacific is the only line running east and west through the northern portion of Ontario. From North Bay there is a Grand Trunk line connecting with the Grand Trunk lines in the southwest and northeast of Ontario. The southwestern portion of this province is pretty thoroughly gridironed by the Canadian Pacific and the Grand Trunk. From Toronto east are the lines of the Grand Trunk and the Canadian Pacific and the Canadian Pacific main line makes connection down the Ottawa between Ottawa and Montreal. The railroad network of eastern Ontario will, however, shortly be rearranged. The James Bay portion of the Canadian Northern will soon be opened from Parry Sound to Toronto. This line is built on a maximum grade of 7-10 of 1 per cent. The portion of this line between Parry Sound and Sudbury will demand more time because of the heavy construction work. The Canadian Pacific also is engaged in building a line between Sudbury and Toronto. The Canadian Northern, too, has filed plans for a line from Key Inlet, near the mouth of the French River on Georgian Bay, to connect with its eastern lines. The same company has a line projected from Toronto to Hawkesbury by way of Ottawa. Between Toronto and Ottawa this new line will run about midway between the Grand Trunk and the Canadian Pacific lines. At present the Grand Trunk has not direct connections from Toronto to Ottawa. By its recent acquisition of the Canada Atlantic it obtained a direct connection from Montreal to Ottawa and now there is projected a direct line from Toronto to Ottawa. East of Ottawa the Canadian Northern will run from Hawkesbury over the Great Northern of Canada, one of its controlled lines. At present it runs into Quebec over the Quebec & Lake St. John tracks. But construction of some 80 miles of track, which has been arranged for, will take it into Quebec over its own tracks. Thence, though the route is not definitely laid out, the line is projected almost due east across northern Maine to a terminus in Nova Scotia. The controlling factors in this company already own lines in Nova Scotia on the east and southeast of Nova Scotia between Halifax and Yarmouth.

When the Grand Trunk came before Parliament to obtain power to build its westward extension it planned to build from North Bay on Lake Nipissing. The Government, however, insisted on a line further north, from Moncton, New Brunswick, to Winnipeg. This eastern portion of the line is to be built by the Government and leased to the Grand Trunk Pacific. Contracts for construction of parts of the line have already been let. Towards Moncton the route surveyed subjects the government railroad, the Intercolonial, to increased competition. This increasing of the competition to which the Intercolonial is subjected is in line with the earlier action whereby the Canadian Pacific short line across Maine was subsi-

dized. The Intercolonial bends north to avoid the northern angle of Maine. In the endeavor to obtain the shortest possible route for the Grand Trunk Pacific, which at the same time must be built wholly on Canadian territory, the line is at one point to run within 200 yards of the international boundary.

While the eastern portion of the Canadian Northern, as far as Quebec, runs through a well settled country, the eastern portion of the Grand Trunk Pacific will be a pioneer line running through unbroken and practically unsettled country. The route selected lies well within the northern limit of the cereal belt, which on the eastern slope of Canada runs as far north as James Bay. The country it traverses will at best be suited only for mixed farming. And a considerable period must elapse before any great tonnage of agricultural products can be obtained. There are, however, great pulp and power possibilities. From an engineering standpoint the line has the great advantage of easy grades.

While the experiment of the Dominion in government ownership has been distinctly unsuccessful, the reverse so far holds in the case of the line which the province of Ontario is constructing. The Temiskaming & Northern Ontario, which was undertaken as a colonization line, runs north from North Bay. It is gradually being extended northward with the intention of intersecting the line of the Grand Trunk Pacific. Later it is expected that it will be continued to the southern end of James Bay. The line, which is being built by a commission, had cost up to the end of last December $7,500,000. For the past year its net earnings were $110,000. Its success has been mainly attributable to the traffic from the silver mining developments at Cobalt. The presence of the cobalt silver ore was revealed by the cuttings when the railroad was being built. On its way north the line runs through the clay belt in which mixed farming is successfully carried on. There is at present under consideration a proposal to use electricity as a motive force, the power to be obtained from the Montreal river.

Portions of the lines which the Grand Trunk Pacific and the Canadian Northern are building are recognized to be simply bridges. To a considerable extent this applies to the construction north of Lake Superior. The Canadian Northern has filed location plans for a line from Sudbury to a connection near Port Arthur, a distance of 560 miles. It is also devoting attention to the acquisition of lake ports. It already has terminals at Port Arthur and it will also have a port at Batchawaung Bay on Lake Superior, as well as ports at Parry Sound and Key Inlet on Georgian Bay. The lines north from Sudbury will open up valuable iron deposits which will be carried by a short rail haul to Lake Superior. The Grand Trunk Pacific has terminals at Port Arthur. A line running south from the main line for about 220 miles will connect with them.

It is when the Northwest is entered that the real strategic center of the present railroad activity is reached. While the surveys of Sir Sandford Fleming, in the early seventies, favored a line running to the north, the Canadian Pacific was finally built through a section in which railroad construction could be more rapidly carried on and railroad subsidies more rapidly earned. With the entrance of the Canadian Northern, which has been built up piece by piece with skilful financing on limited capital, attention was turned to the northern belt. Southern Manitoba is well gridironed by railroads and so the entrance of the Grank Trunk Pacific and the Canadian Northern into Winnipeg means simply additional facilities. To the new provinces these lines are colonizing instruments. In December, 1905, the Canadian Northern had reached Edmonton, the capital of the new province of Alberta, opening up on its way a rich wheat belt in Manitoba, Saskatchewan and Alberta. The line through this section has been called the "railroad of a hundred wheat stations." Construction west of Edmonton is not yet being carried on. It is desired first to let settlement catch up with construction. The Canadian Northern has been criticized for extending its lines east of the lakes, and it has been urged that it should confine itself to delivering its northwest traffic to existing lines east of Winnipeg. Objections of this nature were made by the Grand Trunk, in the early eighties, when it was opposing the extension of the Canadian Pacific lines into eastern Ontario. The entrance of the Grand Trunk, from which line the Canadian Northern formerly received traffic, makes it all the more important for the latter to obtain its own eastern connections. By having lines of its own it will have the advantage of being able to quote through rates. While the bulk of the Grand Trunk Pacific mileage between Winnipeg and Edmonton, its present objective, is under construction, the Canadian Northern has the advantage of having its line already in operation.

It is the lure of the northern wheat fields that is attracting this railroad construction. The advantages of the Canadian hard wheat belt cannot be surpassed. The most northerly of the lines projected falls far within the northern limits of the cereal belt. While this dips down to about 49 degrees near the mouth of the St. Lawrence, it runs to 62 degrees near the Rockies. And it has been shown that wheat can be grown in the far western section as far north as 61 degrees. When all the necessary discounting of the various wild estimates of the real estate boomer in regard to the wheat possibilities of this section are made, it is still readily apparent that there will be wheat tonnage more than sufficient not only for the lines at present under construction, but for additional lines as well. While attention is being turned to the wheat belt it must not be forgotten that the country possesses also mineral resources. In northern Alberta there are deposits of asphalt. North and west there is petroleum. Beds of coal and iron are found further south. In view of the deficiency of satisfactory fuel in various sections of the Northwest the plentiful deposits of lignite in northern Alberta are of value. Although it is low grade, it is cheap and as settlement to the East increases, an increasing tonnage from this source can be worked up.

The section of territory between Edmonton and the Pacific is a question mark so far as the routes of the Canadian Northern and of the Grand Trunk Pacific are concerned. The latter has selected as its Pacific terminal Prince Rupert on Kai-en Island, where 10,000 acres have been obtained. Kai-en Island is situated about 25 miles south of Port Simpson, which was originally spoken of as the terminal. Some years ago negotiations were carried on by Mackenzie and Mann, the promoters of the Canadian Northern, looking to obtaining assistance from British Columbia for a line of railroad to Bute Inlet, near the northern end of Vancouver Island. The railroad was to cross to the island and by construction and the acquisition of the Esquimalt & Nanaimo road an entrance was to be obtained into Victoria. The project fell through and the Esquimalt & Nanaimo has since been acquired by the Canadian Pacific. Between Edmonton and the Pacific the line which the Grand Trunk Pacific has in mind is approximately 1,040 miles long. On the prairie section the maximum grade is to be 4-10 of 1 per cent.; while for the mountain section the grade of 1.75 per cent., which the earlier surveys gave, is to be replaced by one of 1 per cent.

The Canadian Pacific enters the Rockies by the Kicking Horse Pass. North of this is the Yellow Head Pass, which was favored by Sir Sandford Fleming when he was making the Canadian Pacific surveys in the early seventies. Still further north are the Wapiti, Pine and Peace passes. The Peace Pass, the most northerly, has an elevation of 2,000 feet. Use of this pass would take the Grand Trunk Pacific about 460 miles north of the Canadian Pacific. The Yellow Head Pass is about 200 miles north of the Canadian Pacific. The surveys made rule out the Yellow Head Pass and favor the more northerly routes. Which route will be adopted is not yet decided. The railroad will have great advantages in being able to haul maximum trainloads. For, while the Canadian Pacific has a maximum elevation of 5,299 ft., the Grand Trunk Pacific maximum elevation is only 2,400 ft. The Canadian Northern has not yet determined on its route through the Rockies. Its surveys, however, seem to favor the Yellow Head Pass. The advantages to be obtained from the pre-empting of passes has been occupying the attention of Parliament. An amendment to the railroad act has been considered, whereby, when a railroad has monopolized a pass, other roads may, subject to the jurisdiction of the Railway Commission, obtain running rights. The Grand Trunk Pacific has been endeavoring to obtain a subsidy from British Columbia as a condition of building eastward from the Pacific. But until the final surveys are in, nothing will be determined in this regard. The railroad, however, controls the charter of the Pacific Northern & Omenica Railway, which will enable it to undertake this eastward construction if it deems fit.

The stronger financial position of the Grand Trunk Pacific, backed as it is by the Grand Trunk, will probably enable it to be opened through to the Pacific sooner than the Canadian Northern, and so the nature of the country to be opened up by it is of interest. West of Edmonton the great Peace River country will be traversed. There are conflicting accounts concerning this country, but it is known that large portions of it are well adapted to successful wheat growing and that it has magnificent stock raising possibilities. The valley of the Peace river is heavily timbered. Coal lands are also traversed. The railroad will have coal deposits near at hand sufficient to supply fuel to its western lines. The interests which control the Crow's Nest Pass Coal Company have also acquired large areas of coal lands. A good tonnage from this source is in sight. On the way to the coast the railway will open up the rich gold fields of the Oslinca and the Omenica which are now difficult to work on account of lack of transportation facilities.

The wheat belt of the Canadian Northwest starts about 400 miles further west than the eastern limit of the wheat belt of the American Northwest. As the Canadian wheat belt is opened up the rail rate becomes an increasingly important factor in determining the direction in which the grain will move. By the time the Edmonton district is reached, grain rates to the head of the Lakes amount to little except on paper. In this section producers look to the British Columbian mines for sale of their agricultural products. When the railroads push west of Edmonton, attention will have to be turned more and more to the Pacific coast as an outlet. There has been a small beginning in the way of shipments of winter wheat from the semi-arid belt of southern Alberta to British Columbian ports. The words of Mr. C. M. Hays, at the half yearly meeting of the Grand Trunk in March 1904, "There are many of you here to-

day who will live to see the Grand Trunk Pacific hauling as much of its grain towards the Pacific for consumption in China, Japan and that territory as will be hauled in this direction," point to one of the traffic problems the railroad expansion in the west will emphasize. With a view to this the Grand Trunk Pacific intends to have its own steamers on the Pacific. The question of outlets for grain eastward also attracts attention. Almost from the beginning of railroad construction in the Northwest there has been a strong belief in the efficacy of a grain outlet by Hudson Bay as a regulator of grain rates. From Winnipeg to Liverpool via Hudson Bay is 600 miles shorter than via Montreal. The Hudson Bay Company has been handling traffic by way of Hudson Bay for nearly 300 years. In 1884 a committee of the Manitoba legislature in reporting in favor of this route claimed that the shorter mileage would attract not only the grain of the Canadian, but also of the American Northwest. The shipping season by this route is short and much elevator accommodation would be needed at terminals. Other considerations such as heavy insurance and freight rates have to be considered. Also, vessels would have difficulty in obtaining westbound cargoes. However, the advantages of this route are a fixed article in the transportation creed of the Canadian Northwest. A line has been subsidized and has been undertaken by the Canadian Northern. During the latter part of 1905 surveys were made and preparation has been made for construction beginning at Erwood on the Canadian Northern line in Saskatchewan.

While the new lines are thus active the Canadian Pacific has been consolidating and improving its lines and seizing hold of strategic points. By extending its branch lines, country that will be opened up by the new railroad systems will be tapped. Large expenditures are being made in the west. Double tracking between Fort William and Winnipeg will be completed in 1907. At the same time grade reductions to a 4-10 of 1 per cent. maximum are going on in the territory between Winnipeg and the Rockies. The company is pursuing an active educational campaign; pure seed is being distributed, and the success of the winter wheat experiments in southern Alberta is a result of the Canadian Pacific's activity. A great impetus has already been given by it to the dairying industry in Alberta. The strategic importance of the west has also been recognized by vesting more control in its Winnipeg offices so that much greater discretion is now given to Mr. William Whyte, the Canadian Pacific executive west of the Lakes.

Mr. Cassatt.

It is a relief nowadays to run across a really "big" man who didn't sell newspapers when he was a boy, and who never worked 24 hours a day. As an apostle of accomplishment, Alexander Johnston Cassatt, President of the Pennsylvania Railroad Company, has nothing to learn from Russell Sage, and he is a much more comfortable model for the fun-loving American youth.

In addition to being the head and dictator of the greatest railroad system in the world, Mr. Cassatt is President of six other companies and a director in 23; and he has a very large personal fortune to look after, for he was a ready-made man before he started in to make himself over again. He came of a wealthy family, and he might have lived in luxury all his life without ever turning a dollar out of railroading. When he was born in Pittsburg, in 1839, fortunes were not so colossal as they are to-day. Mr. Cassatt is estimated to be worth at the present time $80,000,000, and at least $79,000,000 of that he made out of railroads. The king upon his throne is not a more closely guarded man than he, and it is much easier to get an audience with the President of the United States than to gain admittance to the private office of Mr. Cassatt in Broad Street Station.

This sanctum is a large room, about 40 x 30 ft., guarded by four negro porters and flanked round about by one secretary, three stenographers, and three officials who have the title of "assistant to the president," but who in themselves are large systems. They are to Mr. Cassatt what the larger planets are to the sun. The President's office is furnished in mahogany. The President sits in a mahogany chair, upholstered in leather, before a flat-top mahogany desk. He does not like roll-top desks because he frequently wants to spread out large maps and plans before him. In one corner of the room is a large geographical globe.

All the orthodox rules of business have been cast aside by this Napoleon of transportation. He deals in millions as other men deal in hundreds, and he does it without worrying himself much. His office hours are rarely longer than from 9.30 in the morning to 3 in the afternoon, with an hour and a half or two hours for luncheon in the handsome private dining room adjoining the office. There is a bathroom in the suite, also, and the President often finds time to refresh himself with a plunge. But despite his pre eminent position, Mr. Cassatt is one of the most diffident of men. He is very easily confused, and rarely indulges in wordy battles. The manner in which he forestalled the Vanderbilts by acquiring the Long Island Railroad and then proceeded to establish passenger and freight terminals in the very heart of Manhattan by means of a tunnel system costing $100,000,000, proved his genius for immense accomplishments. He thinks out his schemes while riding about his stock farm "Chesterbrook," near Berwyn, turning his attention readily from a plan to fasten control upon a new soft coal territory to a spavin on the leg of a favorite hackney.

It is doubtful if an abler civil engineer lives in America than Mr. Cassatt. He is no rich idler, no high-born incompetent. His education is well grounded. It was trimmed off by a course in the German university of Darmstadt, and finished in the Rensselaer Polytechnic Institute of Troy, from which he was graduated in 1859, a well-equipped civil engineer at the age of 20. He had a clear head, a wonderful talent for mathematics, and a constitution that seemed to be designed to stand anything.

If this were a sketch of your old-fashioned business man, it would be recorded that he husbanded his strength, but he didn't. He has always smoked large, black cigars, and has never been a Prohibitionist—in fact, he was a gay, rollicking blade in his youthful days, and there is nothing particularly sedate about him now. But when he worked, he worked, and when he played, he played, whole-souled in one as he was in the other. His first service as an engineer was in the location of a railroad in Georgia. He became identified with the Pennsylvania Railroad in 1861, when John Edgar Thomson was at its head. In 1870 he became General Manager of the Pennsylvania.

Two years after this Robert Garrett walked into the office of George B. Roberts, then President of the Pennsylvania Railroad, and exclaimed gleefully: "Mr. Roberts, we have secured control of the Philadelphia, Wilmington & Baltimore. We are not disposed, however, to disturb your relations with it." President Roberts was amazed and not a little discomfited by the easy assurance of Mr. Garrett.

That night there was a meeting of directors, and Mr. Cassatt was the presiding genius. He told them where he could lay his hands on a block of P., W. & B. stock, and before the directors rose from their chairs a check was drawn for $14,949,052.20 to buy it. The check now hangs in a frame at the treasury of the Pennsylvania Railroad, canceled to show that the money was there waiting when it was presented. At the time it was written, it was the largest check ever recorded. The Garretts were completely routed.

General Manager Cassatt was the first prominent railroad officer to take up the air-brake. He was also the first to recognize the merits of the block system, and he installed track tanks. In 1880 Mr. Cassatt had risen to the office of First Vice-President. Everybody supposed that when Mr. Roberts died he would be made President, but he wasn't. Frank Thomson got the place, and Mr. Cassatt withdrew from the road entirely, retiring to his stock farm and giving up his whole time to raising race horses. There is an excellent half-mile track on his farm, where he does a little private racing now and then, but he has stayed off the professional racetracks since his retirement from the Monmouth Park Association, when racing had fallen into bad repute. The fashionable horse shows all have their Cassatt entries and his stables are filled with blue ribbons. At the exhibitions his clothes are always a month or two in advance of the fashions. His shirts are always the very latest thing from abroad, and, if the truth be told, a trifle inclined to obtrusiveness. When Frank Thomson died, Mr. Cassatt, notwithstanding his 17 years of retirement, was chosen President on June 9, 1899.

Mr. Cassatt never made a speech before a large audience in his life, and frankly confesses that he can't. Among a small company of men he can talk forcibly and incisively, but when the crowd swells beyond the dimensions of a directors' meeting he becomes tongue-tied, and can't find the right word. That a man so bashful, so timid, could ever become a captain of finance seems absurd, yet such are the contradictions of the man.

At Broad Street Station and at his country mansion in Haverford, he lives in regal fashion, but in the old Davis mansion on his Chesterbrook farm he frequently entertains distinguished guests at meals which they cook themselves and which are served without waiters. He is impregnable in his office, but he will stop to chat with the humblest citizen of Lower Merion Township, where he has been superintendent of roads for years, and has constructed a system of highways which are unequaled anywhere else in the United States. He is an enthusiastic member of the New York Yacht Club. He has ridden horseback so much that his legs are quite bowed.—*New York Evening Post.*

Foreign Railroad Notes.

An analysis of the passenger earnings and expenses of the Austrian State Railroads by V. G. Bosshardt indicates that for the ten years ending with 1904 the expenses exceeded the receipts in every year except 1895 and 1896, and that since 1900 there has been a loss on the business of a little more than $2,000,000 per year, making the cost of the passenger traffic 116 per cent. of the receipts. The validity of the result depends on the accuracy of the division between freight and passenger expenses. In Austria for

the ten years 59 per cent. of the train mileage, 27.9 per cent. of the car-axle miles, and 26.6 per cent. of the gross (train and load) ton-miles were due to the passenger traffic, and Mr. Bosshardt takes the mean of these, which in 1904 was 37.44 per cent., as the part of the expenses due to the passenger traffic. In 1904 this makes the cost per passenger train mile 81½ cents (which certainly does not seem excessive); while the receipts per passenger train-mile were 65 cents, which is certainly very little. In this country they were $1.14.

Joseph Monier, from whom reinforced concrete is usually called "Monier" construction on the continent of Europe, was a gardener, and in 1867 took out a patent for making flower pots with a wire skeleton filled in with cement—little thinking that bridges and buildings could be built in a similar way. It has been shown that combinations of iron and cement had been used before Monier's day; but the flower-pots seem to have been first to make the process common. Monier died in Paris last March.

Standard Code on the Michigan Central.

The Michigan Central, the last important railroad in the country to make compulsory the use of duplicate orders in train despatching, is now using the Standard Code, and, from the definitions and other features in the book, it appears that in making it up use has been made, so far as was found desirable, of all the latest decisions of the American Railway Association. A comparison of the book with the Standard Code in the form issued by the Secretary of the American Railway Association shows many changes. The very first page (the form of order putting the rules into effect) shows nine paragraphs, instead of the two in the Standard. The "General Notice," on the next page, is also considerably amplified. The "General Rules" have four paragraphs more than the Standard. There is a definition of a side track as distinct from a siding (why not "passing track"?). "Station protection signal" is used to define hand operated semaphores or automatic signals near stations. These signals have the letter S on them.

Rule 6 provides a number of signs different from those used by most roads, a dagger being used for day telegraph stations, a double dagger for night telegraph stations, section (§) for day and night telegraph stations, and T for telephone stations. Under rule 11b an engineman drops a lighted fusee to warn the men on the rear part of the train when the train has parted. Rule 14a provides eight long blasts as a distress signal. Rules 18 and 19 are considerably amplified. Rule 21a provides for the omission of white front-end signals by extra trains on certain double-track divisions. Rule 26a provides for slow signals to be set 3,000 ft. in the rear of a piece of track where speed must be limited; and the limitation is uniformly six miles an hour. Where any other rate is allowed, a properly lettered slow board will be set up.

Rule 86b allows an inferior train to run ahead of a superior train without orders, until instructed by signal or message to take the siding; but it appears from a subsequent note that this rule is not in use on all divisions. Rule 90 has three supplementary rules and rule 93a requires all train men within yards to obey the orders of the yardmaster. When passenger cars are being switched the air-brakes must be coupled and used, if practicable. Rule 95a requires all trains (unless otherwise directed) to have a train order or clearance card when beginning a trip. Rule 96a requires the train despatcher to advise opposing trains in certain cases where signals are taken down. Rule 99 has five supplementary rules and rule 101 requires the rear part of a separated train to be protected in front by torpedoes to prevent its own engine from running into it when returning. Rule 104 has seven supplementary rules. One of these requires freight engines to be detached before taking water, if the train has more than 15 cars.

Beginning with rule 83, the double-track rules are printed separately and in addition to the single-track rules. Rule D 101a requires an engineman, when the air-brakes are automatically applied, to display a lighted fusee from the side of the cab to warn trains on the adjoining main track of possible obstruction on their track. Rule D101d requires a flagman to be on the watch to flag both main tracks, if his train is parted or if he suspects any obstruction to the other track.

The despatching rules require orders to be sent to the operator at the meeting or waiting point, if practicable. When the typewriter is used for copying train orders, copies not written during transmission must be separately repeated to the despatcher.

Rule 210a. When delivering orders the operator will note plainly by figure upon the last order received the total number of orders for delivery to that train, and conductors and enginemen must use this figure as a check.

Rule 211a forbids the use of "19" orders for a superior train, restricting its rights, unless the train order signal is displayed at the meeting point. Under rule 221 the train order signal stands normally at proceed. This rule provides for the use of a hoop in the delivery of "19" orders. At night a green lantern will be used to indicate the location of the hoop.

The non-standard part of the code begins with rule 600. These are called "Special Rules." The first 38 of these rules deal with a variety of subjects and they are not addressed to any particular class. Rule 630 includes elaborate directions against the movement of cars of logs, telegraph poles, etc., with insufficient stakes, wires or cross pieces. Beginning with rule 700 there are brief chapters for each of the several classes, from trainmaster down to brakeman, firemen, crossing flagmen, etc.

Preliminary Report of the Pennsylvania Railroad Special Investigating Committee.

The following is an abstract of the preliminary report of the special committee of the board of directors of the Pennsylvania Railroad Company appointed May 23d to investigate the charges brought against officers and employees of the company during the recent Interstate Commerce Commission inquiry. This committee consists of the following: C. Stuart Patterson, William H. Barnes, Effingham B. Morris, Thomas DeWitt Cuyler and Rudulph Ellis.

The report follows:

Philadelphia, 28 June, 1906.

To the Board of Directors of the Pennsylvania Railroad Company:

The Boards of Directors of the Pennsylvania Company, the Philadelphia, Baltimore & Washington Railroad Company, the Northern Central, the West Jersey & Seashore, the Pittsburgh, Cincinnati, Chicago & St. Louis, the Vandalia, the Grand Rapids & Indiana, the Cleveland, Akron & Columbus, the Long Island, and the Cumberland Valley, requested the committee to make concurrently a similar investigation of each of those companies. The committee selected as its counsel William D. Guthrie, Esq., of the New York bar, and Silas W. Pettit, Esq., of the Philadelphia bar. The official record of the testimony taken before the Interstate Commerce Commission in its recent inquiry has been carefully considered, that record being the only reliable source of knowledge as to that which really was said by the witnesses who appeared before the commission. The record shows that of more than 300 operators of bituminous coal mines, situated on the lines of the Pennsylvania Railroad, less than 10 operators in all have testified that they believed themselves to have been unfairly discriminated against, either in the distribution of coal cars, or in the matter of sidings connecting mine workings with the railroad line. Of the more than 123,000 officers and employees of the Pennsylvania Railroad Company, 51 were examined before the Interstate Commerce Commission, and of those witnesses, 21 were shown to have acquired, in various ways, interests in coal companies or properties, alleged, but not proven, to have received undue and unreasonable preferences in the distribution of coal cars, or in the construction of sidings. Despite public impression to the contrary derived from fragmentary publications of the evidence in the newspapers, the testimony of the witnesses examined before the commission does not prove that there have been, in fact, any undue or unreasonable preferences, either in the distribution of coal cars, or in the construction of sidings.

The full performance of the duty imposed upon the committee requires it to inquire into, and report upon, the conduct of all the business of a railroad system, which operates more than 10,000 miles of line, and which, in 1905, carried 123,431,325 passengers, moved 327,131,839 tons of freight, expended in purchases of real estate, construction, rolling stock, fuel, material and supplies $148,338,774, and paid in wages $120,644,876 to 195,429 officers and employees. The committee has entered upon an inquiry into the system and practice of the several companies in purchases of real estate; the letting of, and supervision over, contracts for construction; the purchases of material and supplies; the conduct of transportation, including the distribution and movement of coal cars; and the selection, discipline and fidelity of officers and employees.

The committee fully realizes the serious nature of the responsibility and the magnitude of the task placed upon it. Charges affecting the intelligence and the fidelity of the company's administration, and the integrity of a small number of its officers and employees have been widely disseminated. It is due to the shareholders and security holders that those charges should be so thoroughly investigated, that the owners of the properties may know whether those to whom they have committed the management are, or are not, faithful to the trust reposed in them. It is equally due to the great body of officers and employees that the many who are innocent should not have to bear the burden of the few who may be guilty; that those who shall, after fair and full examination, be found to have done wrong should receive proper punishment; that those who may have been indiscreet should be admonished; and those who have been, and are, loyal to duty should be relieved from unjust aspersions.

The obvious method of procedure is to determine in the first place what, if any, wrong has been done, and in the next place by whom the wrongful acts have been committed. The committee has, therefore, asked from every officer whose action could in any way

affect the distribution of coal cars, statements describing the organization for, and the rules and methods, both past and present, governing the distribution of coal cars; the reasons for giving special orders in any case or cases, explanations of the conditions attending the ownership of coal cars by shippers, the rules governing their use, and the compensation therefor; and all comments, explanations, or statements, which would be of assistance in ascertaining the facts. The committee has received from every such officer categorical replies to those inquiries, but until the company's records of the daily movement of cars can be examined and tabulated, it is obviously impossible to know the distribution of cars actually made, and wherein, if at all, such distribution varied from the rules governing the same.

That tabulation involves the examination and comparison of many thousand reports, and will require the services of a large clerical force, and the officers having the direction over, and the responsibility for, the distribution of the cars have requested that this work be done by accountants selected by and working under the supervision of the committee, so that the tables, when prepared, may be free from any suspicion of bias. The Audit Company, of New York, has therefore been employed, an accountant corporation well and favorably known in the financial centers of both Europe and the United States, and has been instructed to undertake an expert investigation of the facts set forth in and by the Pennsylvania Railroad daily reports, and the other records of coal car distribution, as rendered from each of its nine bituminous mine regions, during the period from January 1, 1900, to July 1, 1906, inclusive; to determine the percentage of cars allotted at all times to each coal operator, the over and short variations from the allotted numbers of cars shown by the figures of actual cars supplied; to furnish tabulations setting forth the monthly and yearly results in totals, of any such over and short variations; to add to those tabulations every fact obtainable regarding the reasons which may have led to the distributing of cars in a manner different from the requirements of allotted quotas; to critically and carefully investigate and report upon any and all special orders which may have been issued in any manner, or at any time, since January 1, 1900, affecting the distribution of coal cars; and to report at the earliest possible moment consistent with the accomplishment of a thorough and searching investigation. By direction of the President of the Pennsylvania Railroad every facility has been, and will be, given to the Audit Company in its investigation. The Audit Company has entered upon the performance of that duty and now has at work nearly 50 trained accountants. When the Audit Company shall have reported, the committee will be prepared to fully report upon the effect and operation of the past and present systems of car distribution, and the actions of all officers of the company thereunder.

At the present time it is proper to call attention to the inherent difficulties of the subject. In the supply, distribution and movement of coal cars the officers of the railroad have to regard the interests and just claims, not only of mine operators, but also of consumers, including other railroads, navigation companies, municipalities, gas companies, electric light companies, etc., who must have punctual fulfilment of shippers' contracts to enable them to perform their public services; the interests and just claims of the public who want the market adequately supplied with coal to meet their necessities; and also the interests of the shareholders of the railroad, which require the cars to be promptly loaded and moved so that as much revenue as possible may be received from the movement; and, chiefly, the officers must see that, whoever else fails to get cars, the shippers who have contracted to supply coal to the engines of this company have sufficient cars for that purpose, or otherwise the operations of the line would be in danger of being blocked. The fundamental difficulty in the question of coal car supply is that the shippers' demands are not so constant during the year as to justify an investment of capital in a sufficient number of cars to meet the possible maximum demand. There must, therefore, be a fair system of pro rata distribution, but whatever be the system, there will inevitably come periods when the demand for, will exceed the supply of, cars, because of increased marked prices, sometimes caused by weather, sometimes by strikes in other territories, or by suddenly increased industrial development. Under such conditions, priority must be given, first to shippers who furnish coal to the company's engines; and next, to those whose fulfillment of contracts will keep other railroads in operation, prevent municipalities from being left in darkness, or enable steamships to sail, etc. It is not to be assumed, without proof, that any special order was issued by any officer from any improper motive. On the contrary, the reasonable presumption is that every such order was issued only because of a sufficient business necessity.

The question of the independent, or privately owned, coal cars is not a new question, nor one which admits of an offhand solution. The Pennsylvania Railroad was chartered on the theory that it would build the line and the shippers would furnish their own means of transportation. The greater part of the coal tonnage of England is moved to-day in privately owned cars. The use of such cars on the Pennsylvania Line is not peculiar to a few favored shippers. They have been used from the beginning of coal transportation. There are now in use on the lines of the Pennsylvania Railroad Company 26,899 independent coal and coke cars owned by 59 different corporations or firms. All shipping companies of large capital desire to have their own cars, because, having them, they can protect their own contracts, and because they can direct the movements of such cars in their own interest. Cars so owned are also in some respects advantageous to the railroad; for the reason, that while individual cars, when sent off the line of the railroad must be promptly returned, cars owned by the railroad are in danger of being kept on other lines, because it is, in times of great demand for cars, cheaper for those other lines to pay per diem for such cars rather than build cars for themselves.

The committee has sent to every officer and employee, 2,501 in all, of the several companies whose individual action, or whose order to any subordinate, could effect any undue and unreasonable discrimination for, or against, any customer of his railroad, or could prejudice the interests of his company by favoritism in contracts, or in purchases of material or supplies, interrogatories, specifically inquiring whether, since January 1, 1900, he has been, in any way, pecuniarily interested or concerned, directly or indirectly, in or with any corporation, association, co-partnership, or individual whose mines, mills, manufactories, or enterprises, are located on the lines of the Pennsylvania System, or any of them, or whose coal, manufactures, or commodities are transported on those lines, or any of them; and also whether he has been in any way pecuniarily interested or concerned, directly or indirectly, in, or with, any corporation, association, co-partnership, or individual doing work for, or furnishing material, or supplies, to the Pennsylvania System; and also whether he has received any commission, compensation, gift, gratuity, or bonus, of any nature or kind whatsoever, from any shipper, or from any individual, natural or corporate, doing work for, or furnishing materials, or supplies, to the Pennsylvania System. Full and explicit interrogatories have been received from all but 92 subordinate employees, from whom full answers will be secured. The committee has investigated, or is investigating, the material facts disclosed in each answer. If further information shall be received, rendering it advisable so to do, similar interrogatories will be sent to other officers and employees.

It does not need the authority of either a statute of the state, or a by-law of the company, to establish the principle that the duty of an officer or employee to the railroad company which he has undertaken to serve forbids him to gain a personal profit at its expense by participation in contracts with, or sales to, the railroad; and that that same duty equally forbids an officer or employee to unduly favor any customer, to the disadvantage of any other customer, of the railroad, or to place himself under such personal obligations to any customer of the railroad as may possibly interfere with the officer's or employee's full and faithful discharge of his plain duty. The committee will investigate every fact which is, or may be, brought to its attention, affecting the performance by any officer or employee of his duty to the company, or the performance by the company of its duties to the public; and will report its conclusions in every case to the President, in the confident assurance that no ownership, or practice, calculated in any way to affect the full and impartial discharge of the duties owed by the respective officers and employees to the company, or by the company to the public, will be condoned; and that every officer or employee, who, after full investigation, has been, or shall be, found to have failed in the performance of his duty, will be properly dealt with.

In its early history the great problem for the company was the development of industrial enterprises in the territory through which its lines ran, in such a manner as to create and secure traffic. To-day the problem is that of providing adequate facilities in line, rolling stock, and movement for the business of the country, which rapidly outgrows such facilities. While, under former conditions, it was right that officers and employees should have been encouraged to invest their own money in, or to personally assume financial obligations for the purpose of developing industrial enterprises on the line of the road, for the practical reason that, if officers and employees did not so invest, it would have been difficult to induce other people to make such investments; it nevertheless has been always understood that no such investment of money, or assumption of financial obligation was permissible if it affected the officer's or employee's performance of his duty. Under the conditions of to-day, as they have been stated, it is essential that all officers and employees should be absolutely free to discharge their duties impartially. Applying this principle to the coal trade as an illustration, the keen competition of to-day requires every officer and employee of the Pennsylvania Railroad to part with any investments which he has in the shares of any coal producing company, and also to part with any interest which he has in or with any firm or individual mining coal, on any of the lines of the Pennsylvania Railroad System; and every officer and employee should be required to refrain from any investments whatsoever, which may possibly prejudice or affect the interests of the company, or interfere with its full discharge of its duty to the public.

Hicks Locomotive and Car Works.

The Hicks Locomotive and Car Works, of Chicago, formerly F. M. Hicks & Co., was incorporated in May, under the laws of New Jersey, with a capital of $1,200,000. The corporation took over the business of F. M. Hicks & Co., a co-partnership existing between F. M. Hicks and William McInnes. The officers of the new company are: F. M. Hicks, president; Elliott C. Smith, vice president; William McInnes, treasurer; E. Hope Norton, assistant treasurer; C. A. Ralston, assistant to the president. The business of the company is buying and selling second-hand locomotives and cars; repairing cars and locomotives for railroads, and for corporations and private owners lacking the facilities for such repairs, and building new equipment, including that from special designs, such as private or special cars.

Mr. Hicks began this business in 1897 and the modest nature of his beginning is indicated by the accompanying view of his first plant at Chicago Heights. But the business grew fast and the plant was rapidly enlarged. About four years ago (Nov. 7, 1902) some views of the works at Chicago Heights and a description were published in these columns, additions and improvements at that time having made of them practically a new plant. In the time that has since intervened, further enlargements of the buildings and additions to the equipment have been made. But the business outgrew the capacity of the plant and a material enlargement of some sort again became necessary. This enlargement was obtained by the acquirement of another plant located about half a mile east of the first plant, now known as the West Works. The new plant is the East Works, and is used exclusively for freight car work—both repairs and building new equipment.

ORIGINAL PLANT 1897

The East Works were bought about a year ago. The perspective view shown herewith, made from a wash drawing, includes two buildings which have not yet been erected; two-story building in the foreground, which is to be a storehouse and which at present is an uncovered storage platform; and the one at the left with the saw-tooth roof, which is to be the steel car repair shop. The original tract contained 20 acres. Additional tracts adjoining, aggregating 38 acres, have been secured, providing ample room for future growth.

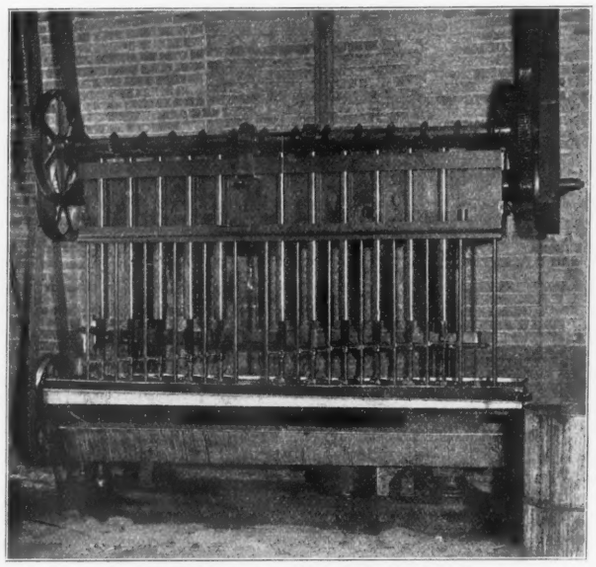
The buildings are brick and are of substantial construction. The plant was originally a tube mill, so that practically all of the equipment for car work had to be installed by the present owners. The ground plan shows the arrangement of departments. The transverse building, at the right in the perspective view, is 225 ft. x 65 ft. and the two longitudinal buildings adjoining it are 280 ft. x 60 ft. each. Between these two a space of 20 ft., originally open, was roofed over and is now used as the wood mill. The building containing the power station and blacksmith shop was extended 200 ft.

The present power station equipment was a part of the original plant. It consists of a 200 h.p. Westinghouse vertical engine belted to an alternating current dynamo, to furnish light for the plant. It is intended to replace the engine with another of 500 or 600 h.p. and to add another generator, direct-current, for power purposes.

Much of the works equipment is new, though some was brought over from the West Works. Additional equipment has been ordered, such as another six-spindle arch-bar drill in addition to the two now in use, and a 30-in. drill. Two 7,000 gal. oil storage tanks to supply the blacksmith furnaces are being placed and the foundations have been started for the steel car repair shop, 180 ft. x 400 ft. Eventually new steel cars will probably be built in this shop. The plant is at present busy building 300 stock cars for the Chicago Great Western and 300 gondolas for the Midland Valley. The present capacity of the plant is from 10 to 15 freight cars a day.

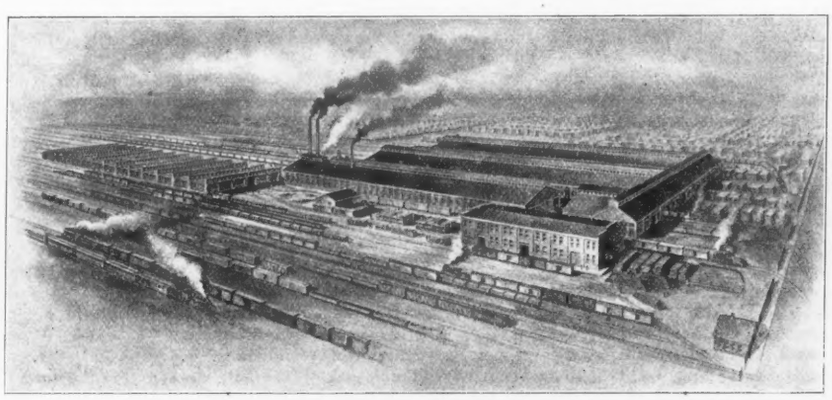
Reference has been made to enlargements and improvements to the West Works since the previous article. These works are now devoted to locomotive and passenger car work. A ground plan and a perspective view of this plant also are shown. The principal building changes have been the erection of the storehouse, the increase to two stories in the height of the south bay of the erecting shop, and the roofing over of the 24 ft. space between the boiler and erecting shops. The tool room was moved to the space formerly occupied as a storeroom and the office moved entirely to the second floor. The dry kiln was enlarged so as to increase about three times its capacity. The increased height in the south bay of the erecting shop provided new and much larger quarters for the brass department, which formerly had space on the second floor of the east bay. The hat racks, coach door locks, etc., for the passenger cars are made here, the castings being bought outside, however.

One of the most important and helpful of the equipment installations is a 6-ton trolley hoist which travels on an I-beam track from the storehouse through the erecting shop and down the roofed-over areaway between boiler and erecting shops, already referred to. It greatly facilitates the handling and distribution of material. Other important new equipment includes a doublehead 72-in. boring mill, individual motor driven; a 6-ft. radial drill; a 30-in. x 30-in. x 8-ft. Gray planer; a Le Blond No. 3 milling machine; a turret lathe, a triple-head bolt machine and a 22-in. x 10-ft. lathe. It is the intention to have all of the larger tools individual motor driven in the near future.



Staybolt Threading Machine.

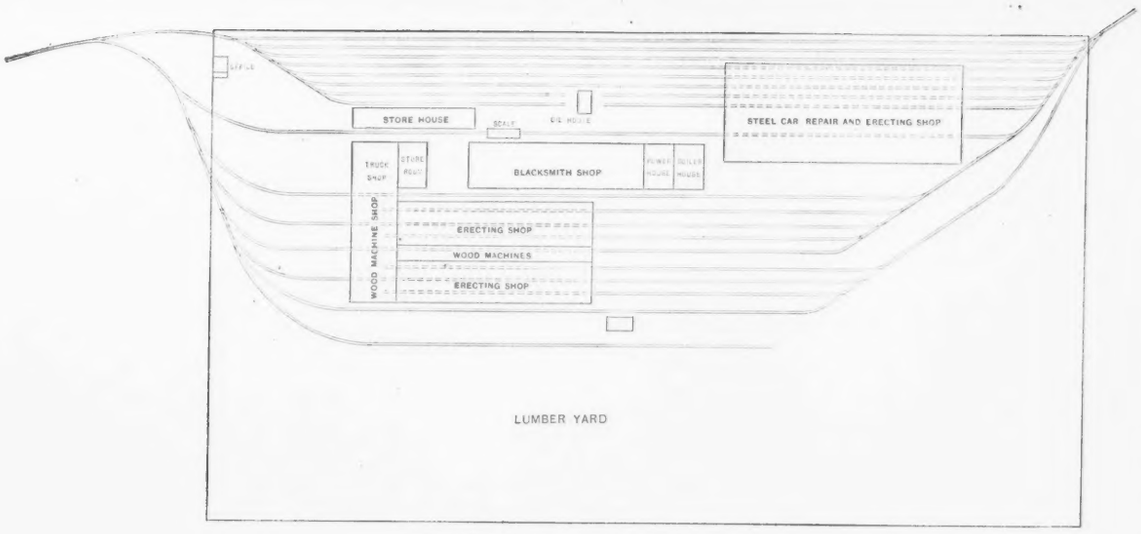
In the blacksmith shop oil fuel was provided for the furnaces, a 1,500 lbs. steam hammer was installed and a Wangler rotary beveler. In the boiler shop another punch and shear was added; also an interesting staybolt threading machine, a view of which is shown herewith. This machine was adapted from a 12-spindle vertical drill. One spindle was removed to permit the addition of a bearing at about the middle of the transverse shaft in order to stiffen it, so that 11 spindles are available for staybolt work. One man runs the machine, which has a capacity of over 2,000 bolts a day.



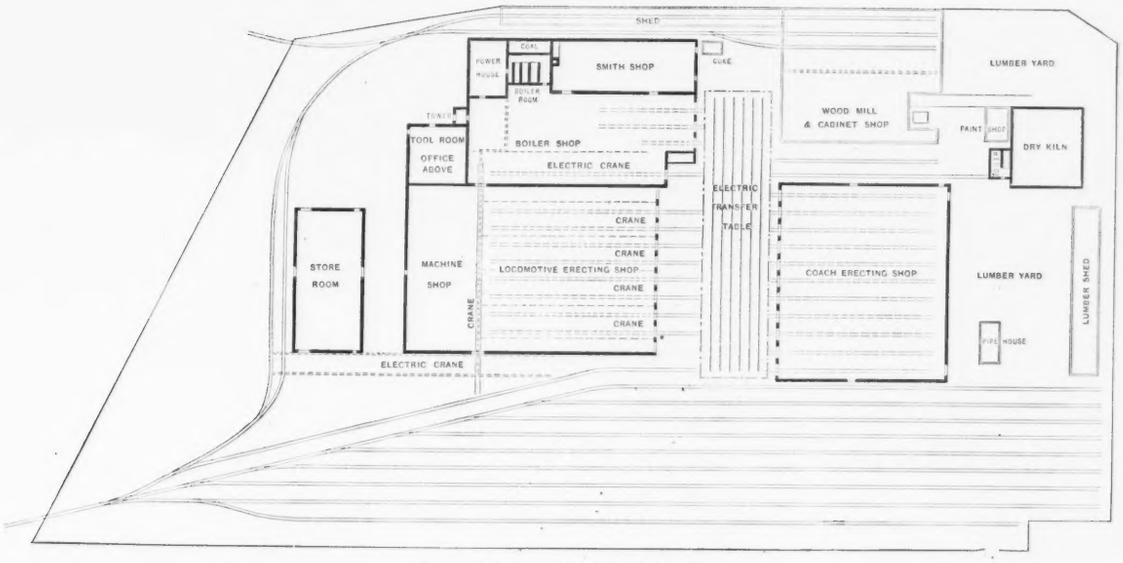
Hicks Locomotive and Car Works—East Works.

A number of up-to-date tools have been added to the wood mill, enlarging its capacity and improving the character of its output. These include a gainer and trim saw; miter saw and beveling jointer and facer; three-side moulding machine, for sash chiefly; four-side 9-in. moulding machine; carving machine; chain mortiser; heavy sticker, tenoner, and band saws.

In the coach shop there are at present under way six electric-



Ground Plan of East Works.



Ground Plan of West Works.

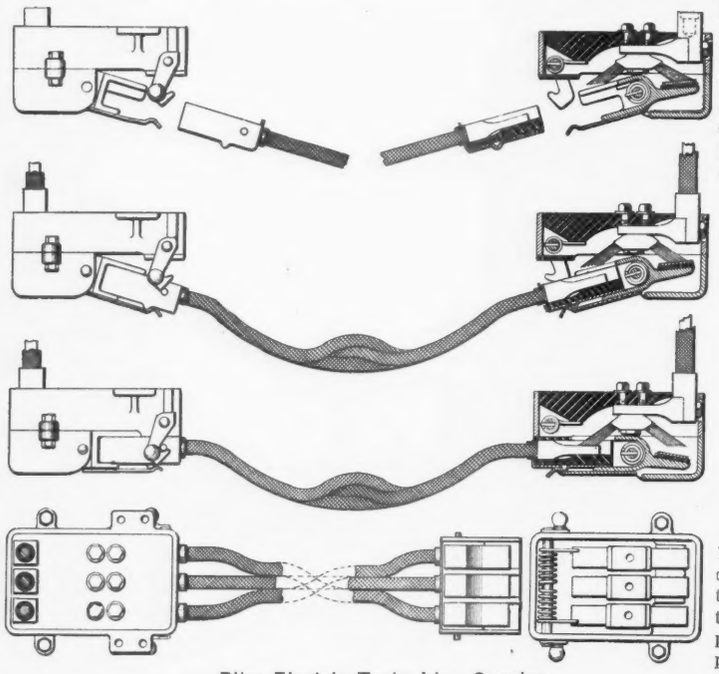
Hicks Locomotive and Car Works—West Works.

lighted coaches for the Atlanta, Birmingham & Atlantic; two coaches for the Munising Railway; three for the Marquette & Southeastern, and six cars for the Atlantic Coast Line—four baggage, two mail and two combination, and a private car for the Western Union Telegraph Co. A private car for the Long-Bell Lumber Co. of Kansas City has just been completed; also a car for the Kansas Fish Commission, and eight coaches for the Bessemer & Lake Erie.

Since the previous article the number of employees has been about doubled, there being over 900 now.

A Lost Railroad in Siberia.

Near Irkutsk in Central Siberia is a series of rapids on the Angara river. After many disasters, the river transport companies decided in the early '70s to build a short railroad for transshipment of freight around the rapids. The 12-mile road was probably the first railroad built in Asia outside of India and certainly the first one built in northern Asia. The gage was 7 ft. and the rails were supplied by a native iron foundry. They consisted of a single thick web with flush sides held to the ties by iron spikes driven each side of the rail deep into the sleeper until the top of the spike was even with the top of the rail. Where these worked loose the rail was reinforced by several turns of iron wire bodily bound around and over rail and sleeper. The single locomotive had a square shaped



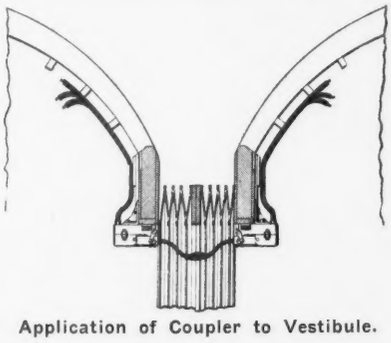
Bliss Electric Train Line Coupler.

water tank and was built by engineering students at a technical school in western Siberia. To "improve the draft and lessen the emission of live cinders" two smokestacks were built, one directly behind the other and about an inch apart. The ties were whole tree lengths unsquared cut from the forest through which the road ran. The operating force consisted of a mechanician, a fireman and a brakeman. A freight shed at each end of the road and a few flat cars constituted the entire buildings and equipment. There was no regular service, about two trips each way being made a week, as cargo offered. With the improvement of the roads through this region by the Russian government, traffic on this part of the river was gradually abandoned and the railroad finally fell into disuse. The locomotive was acquired by a farmer to be used once a year to drive a threshing machine, the cars were taken off on barges and towed away, and the line abandoned.

Some fifteen years later the locating engineers of the Trans-Siberian Railroad entering this part of Siberia, heard rumors of a railroad which had existed many years previously. This is a vast region of sierra, forest, tundra, steppe and—here and there—of rinc (untranslatable; literally, "quick mud"), and presented great difficulties for railroad construction. News of an abandoned line which had been successfully operated was, therefore, received with much interest and search was made for the road. The freight sheds were finally discovered and then the line of the road marked by the clearing in the forest, but no trace of the rails or roadbed could be found. The right of way was much overgrown with underbrush and, bordered with the dense forest, was almost as black and cold as a mountain tunnel, the sun being just visible lighting up the topmost branches of the giant firs. The railroad itself had completely disappeared. Not a rail, not a sleeper, only an occasional suggestion now and then of what had once been rude cross-drainage ditches. In an effort to find the track, picks were driven as far as they would go into the earth, only to bare masses of tangled roots. The railroad was lost. It could not have been burnt up, because there had been no fires, nor stolen and carried off piecemeal, for the region was totally lacking in population. Moreover, the old freight houses remained with their locks intact and packages of overlooked goods in good condition within them. It is believed to have been a case of gradual subsidence. The unballasted track through the forest, gradually depressed by a few years' traffic, naturally became a drainage conduit for the surface water of the forest, rendering in time the subsoil spongy throughout. The significance of the fact that the line was much overgrown lies in the fact that this undergrowth probably owed much of its origin and profusion to the taking root of the submerged tree-length ties. There was never any ballast and in some unusually warm summer it is probable that the watersoaked tree sleepers, weighted down by the cumbrous pig iron rails, sank beneath the surface and there sprouted.—*L. Lodian in Electrical Review.*

Bliss Electric Train Line Coupler.

The accompanying illustrations show the operation and application of the Bliss train line coupler for electric car lighting systems. This device differs essentially from the ordinary types of plug couplings in use. It employs a construction very similar to that used in standard circuit breakers. The contracts are made by pressing with great force a set of solid brass contacts against a set of laminated copper leaf brushes. This gives a large current carrying capacity and reduces contact resistance to a low point. There is practically no energy loss and very slight heating at the contacts. As will be seen from the smaller illustration, the coupler is mounted



Application of Coupler to Vestibule.

in the passageway of the vestibule, in the usual manner. The coupler proper consists of two parts, an upper fixed part containing three double laminated brushes and lugs for the attachment of the train lines, and the latching mechanism. The lower, or removable part, contains a pivoted knuckle, which forms the guide and support for the connector and also carries the jumper mechanism for use when a three-wire train line system is used. The larger illustration shows the coupler in three positions in making the connection. The top view shows the pivoted knuckle dropped, ready to receive the removable plug. The insulated contact on the rear end of the pivoted knuckle is in contact with the rear ends of two of the copper brushes and in this position the jumper mechanism is properly connected. The second view shows the plug at the end of the flexible cable inserted in the knuckle. In this position the jumper connection is still made and contact with the front ends of the brushes has not yet been established. The third view shows the coupling completed. The front end of the knuckle is forced up and in doing so a sliding contact between the brass connector contacts and the laminated copper brushes is formed while the jumper connection at the back end is broken. The catch on the outside of the box automatically drops into position and holds the coupling firmly in place. To uncouple, the catch is lifted and the plug removed from the knuckle. This operation automatically connects the jumper and this connection is maintained until the connector plug is again inserted. By means of the spring catch on the bottom of the pivoted knuckle, provision is made for automatically uncoupling in case the train parts, without damage to the flexible cables or the couplers on either car.

The jumper is so constructed that it can be easily changed from connecting one pair of train lines to connect the other pair. This makes it unnecessary for the purchaser to specify in ordering which wires the jumper should be made to connect. Perfect contact is maintained at the brushes by the scraping action of the brushes on the solid contacts every time a coupling or disconnection is made. The device is made by the Bliss Electric Car Lighting Co., Milwaukee, Wis.

GENERAL NEWS SECTION

NOTES.

The Mobile & Ohio has reduced by three hours the time of its through day train between St. Louis and Mobile.

The honorary degree of Master of Arts was at the recent commencement bestowed by Yale University on Charles S. Mellen, President of the New York, New Haven & Hartford Railroad.

The Pittsburg Chamber of Commerce has established a bureau of statistics of traffic to and from the Pittsburg district, and it has been put in charge of Mr. J. A. Lord, formerly in the service of the Southern Railway.

The Attorney-General of Ohio has ruled that the law of that State forbidding passenger fares above two cents a mile applies on interstate traffic for the portion of the passenger's journey within the State of Ohio.

At Peoria, Ill., a coroner's jury, reporting on the death of a section laborer who was killed in a collision of hand cars, declares that the railroad company is to be censured for employing foreigners unable to understand the orders of their foreman.

At the tenth annual meeting of the Veteran Employees' Association of the Middle division of the Pennsylvania Railroad which was held at Harrisburg June 21, about 500 members were present. The President of the Association is Mr. C. A. Preston, Superintendent of the division. The organization now has 1,200 members.

The Lehigh Valley Railroad has established a freight station at 149th street, New York City, on the east side of the Harlem river. Cars will be taken there on floats. This station is about 12 miles from the terminus of the Lehigh Valley tracks at Jersey City, and is the most northerly freight station within the lighterage limits of the harbor.

The Pennsylvania Railroad, required to produce certain books in court in connection with the Interstate Commerce Commission's coal traffic inquiry, has applied to the judge of the court for an order compelling the Webster Coal & Coke Company and the Pennsylvania Coal & Coke Company to produce certain books to be inspected by the railroad company.

Messrs. Westinghouse, Church, Kerr & Co., who are building for the New York, New Haven & Hartford the new power station at Cos Cob, report that the structures are nearly ready for the first instalment of electric machinery, which is being pushed at the Westinghouse works in East Pittsburg. The first generator is already in the testing department. The initial installation will have a capacity of 13,000 h.p., consisting of Westinghouse-Parsons steam turbines and Westinghouse a. c. single-phase generators. The statement comes to us from the manufacturers: "It is now within the range of possibilities that the first single-phase electric train will run on the New Haven road between New York and Stamford before the summer is over."

A law restricting the issue of free passes, which was passed by the last Legislature of Iowa, went into effect July 4; and the railroads of the state have notified certain persons now holding passes to return them to the company. The passes thus cut off are: City, county, district, state or federal officers, including judges and members of the General Assembly; delegates to any political convention, traveling to or from such convention; members or employees of any political committee; candidates for any city, county, district, state or federal office; jurors in state or federal courts. The statutory prohibition does not apply to notaries public, persons holding an office which pays no fees or salary, officers or members of any state educational institution, officers or directors of the Iowa State Board of Agriculture, members of the Iowa National Guard or of any fire department.

By agreements recently made at Atlanta the railroads of the southeastern states, beginning July 15, will sell interchangeable mileage tickets at 2½ cents a mile. Two forms of book are used, one in each of two districts. The first district includes lines of the Central of Georgia, the Georgia Southern & Florida, the Louisville & Nashville, the Atlantic Coast Line, the Georgia Railroad, Atlanta & West Point, Norfolk & Southern, Atlantic & North Carolina, Virginia & Carolina. Those in the second district are the Southern, the Central of Georgia, the Georgia Southern & Florida, the Alabama Great Southern, the Cincinnati, New Orleans & Texas Pacific, the Blue Ridge, the Augusta Southern, the Northern Alabama, the Richmond, Fredericksburg & Potomac, and the Washington Southern. Each book is good over about 15,000 miles of road. The commercial travelers, at whose request these tickets have been issued, are said to be still unsatisfied. They want a reduction in rate as well as an interchangeable ticket.

The Interstate Commerce Commission has won its suit in the United States Circuit Court at East St. Louis in the case of St. Louis Hay & Grain Company against the Southern Railway. The suit was brought to recover $1,572 awarded by the Commission to the Hay Company to be paid by the Southern as reparation for excessive charges on hay in carloads reconsigned from East St. Louis to southern points. The rate in question was 4 cents per 100 lbs. greater than the rate from Ohio River points. At the same time the Southern charged only 2 cents above the Ohio River rate when the hay was not unloaded in East St. Louis, regardless of whether the hay was shipped locally to East St. Louis, or through-billed from the point of origin to the point of destination, or of provisions in the published tariffs concerning through billing. The Commission found that the average expense to the carrier on reconsigned hay which had been unloaded in East St. Louis was only about 1 cent per 100 pounds greater than where the hay was forwarded without unloading, and the reparation awarded was at the rate of 1 cent. The court adopted the findings of the Commission as the special findings of the court, the case having been tried by consent before the court without a jury. The judgment of the court includes interest and is for $1,659, to which are to be added costs and an attorney's fee to be hereafter fixed.

Disastrous Derailment at Salisbury, England.

By the derailment of an eastbound fast express train at Salisbury, on the London & Southwestern, at 2 o'clock last Sunday morning, 27 persons were killed and six or more were injured. Twenty-three of the killed were Americans, being passengers from the American Line steamship "New York," which had landed at Plymouth a few hours before. The train was a steamer special, taking these passengers to London. At the time of the derailment it was running at very high speed through the moderate curve to the right just beyond the Salisbury station, and the derailed engine and cars ran into a milk train standing on one of the other main tracks. One or more of the wrecked cars stopped on the bridge which spans Fisherton street, just east of the curve, and some of the occupants of the cars fell to the pavement below. The only cause for the derailment thus far suggested is high speed. Neither the officers of the railroad nor the inspectors of the Board of Trade, who examined the track and the wrecked cars and engine, were able to discover any defect or injury in either which seemed likely to have caused the derailment. The press despatches say that all trains are subject to a rule restricting their speed to 30 miles an hour passing Salisbury station. The train consisted of a large engine, four corridor coaches and a combined guard's van and buffet car.

Bonds for the Panama Canal.

The Secretary of the Treasury offered to the public on July 2 $30,000,000 of the bonds of the Panama Canal loan authorized by the Spooner act June 28, under which the canal construction is being carried on. The bonds will bear 2 per cent. interest, and will be dated August 1, 1906. They will be issued in denominations of $20, $100 and $1,000 of coupon bonds, and of $20, $100 and $1,000 and $10,000 of registered bonds. They will be redeemable at the pleasure of the United States after 10 years from the date of their issue, and will be payable 30 years from that date.

Bids for the bonds must be submitted on or before July 20, 1906. The bonds will be ready for delivery about August 1, 1906.

Shipbuilding in the United States.

A statement issued on July 2 by the Department of Commerce and Labor shows that during the fiscal year ended June 30, 1906, 1,463 merchant vessels, of 421,744 gross registered tonnage, were built in this country, compared with 1,301 vessels of 326,213 gross tons for 1905. Of the new tonnage, 384 vessels of 73,399 gross tons were unrigged barges and canalboats. The year's increase has been entirely in steel steamers on the Great Lakes, which numbered 52 and measured 237,724 gross tons, compared with 29 vessels of 102,497 gross tons the year before.

Site for Branch Post Office in New York.

Postmaster General Cortelyou has bought from the Pennsylvania, New York & Long Island Railroad land to be used for a branch post office at the new Pennsylvania terminal in New York. The property extends from 31st to 33d streets, on the west side of Eighth avenue, and is about 460 x 415 ft. A private street will run along

its west side, north and south, and, as in the case of the passenger station, east of Eighth avenue, tracks will run under the building. The price paid is $1,660,085. The Government reserves the right to construct public entrance approaches on the north, east and south sides of the building, to carry mail tubes across the reserved spaces, and to gain proper access to the building should it desire to connect with the city Subway lines.

Locomotive Exhaust Deflector.

An Atlantic type locomotive of the Great Northern Railway of England has been fitted by Mr. H. A. Ivatt, Mechanical Superintendent, with the smoke deflecting device, patented by Mr. J. F. S. Cridland, drawings of which are shown herewith.

The object of the invention is to prevent smoke, gaseous products of combustion, and steam issuing from the chimney from beating down in front of the cab windows—a very usual occurrence where the modern high boilers and short smokestacks are in use—and thus obstructing the view of the engine driver.

In Mr. Cridland's device a passage for admitting air is formed in the upper part of the front plate of the smoke-box above the door, and this passage or duct has an upwardly inclined inner bottom converging from the shell of the smoke-box round the internally-extended or "trunk" portion of the chimney, which trunk or petticoat pipe is surrounded eccentrically by an oval or other shaped casing so set as to leave the exit of the passage or duct through the mouth of the casing at the back of the chimney; or the casing may be concentric to the chimney extension with the annular space, so formed, closed at the front, leaving the exit at the back of the chimney.

The rush of air through this duct when the locomotive is running thus finds a vertical exit at the back of the chimney and thereby strikes up against the smoke, gas products and steam as they issue from the chimney and forces them upwards, thus preventing their striking against the cab windows and obstructing the view of the engine driver.

In applying the device to engines Mr. Ivatt has fitted a hood, standing out from the smoke-box some three or four inches, just above the opening, for admitting air; this greatly assists in inducing and directing a current of air through the passage or duct.

Locomotive Exhaust Deflector as Applied to Great Northern of England Atlantic Type Locomotive.

Railroad Elevation in Chicago.

The Pennsylvania-Lake Shore Elevation ordinance and the Chicago & North-Western ordinance have been passed by the City Council. The former provides for the elevation of all tracks from Stony Island avenue to the Indiana state line. Through south Chicago fifteen streets will be opened. This work is to cost $5,200,000 and when completed will give the railroads practically a continuous elevation from their city termini to the Indiana state line.

The North-Western ordinance provides for the elevation of the Evanston branch of the main line from Balmoral avenue to the Evanston line. Permission to extend the elevation through Evanston has been secured. The work will cost between $1,000,000 and $2,000,000.—*Wall Street Journal.*

Suits for Violation of Safety Appliance Law.

A press despatch from Washington says that the Attorney-General has brought suits against 26 railroads for violation of the Safety Appliance law; that is to say, for using cars not equipped with serviceable automatic couplers or running trains not suitably air-braked. Against one road, the Atlantic Coast Line, 52 violations are charged. The roads against which suits have been brought are the Atchison, the Atlantic Coast Line, the Burlington, the Chicago, Milwaukee & St. Paul, the Rock Island, the Colorado & North Western, the Colorado & Southern, the Denver & Rio Grande, the El Paso & Southwestern, the Missouri Pacific, the Muscatine North & South, the National City & Otay, the Norfolk & Western, the Northern Pacific, the Rio Grande & Pegosta Springs, the St. Johns River Terminal (Florida), the San Pedro, Los Angeles & Salt River, and the Seaboard Air Line.

Underground Telegraphs in England.

The British Postmaster General, in a recent letter, says that the government underground telegraph line between London and Glasgow has been completed, and that a branch toward Manchester has been finished as far as Leeds. An underground line has been laid from London eastward to Chatham and another westward to Slough. Within the present year it is expected to extend this line to Bristol.

Railroad Built in Texas in the Half Year.

The engineering department of the Texas State Railroad Commission has compiled the following approximate estimate of railroad mileage (main line) constructed in Texas during the six months ending June 30, 1906:

Beaumont & Great Northern, between Trinity and Onalaska, 15.7 miles; Galveston, Harrisburg & San Antonio, from Stockdale southeast, 38.3; Houston & Texas Central, between Mexia Junction and Jewett, 27; Kansas City, Mexico & Orient, between Sweetwater and Knox City, 21.9; Pecos & Northern Texas, from Canyon City south, 0.8; St. Louis, Brownsville & Mexico, between Refugio and Algoa, 26.6; Trinity & Brazos Valley extension; 89; Wichita Valley, from Seymour to Weinert, 33. Total, 252.3 miles.

Approximate estimate of railroad mileage (main line) constructed in Texas during the year ending June 30, 1906:

Beaumont & Great Northern, from Trinity to Onalaska, 19.7 miles; Galveston, Harrisburg & San Antonio, from Stockdale southeast, 38.3; Houston & Texas Central, from Mexia Junction to Jewett, 28; Kansas City, Mexico & Orient, from Sylvester to Knox City, 55.9; Orange & Northwestern, from Buna to Newton, 31.2; Pecos & Northern Texas, from Canyon City south, 0.8; St. Louis, Brownsville & Mexico, between Refugio and Algoa, 127.6; Trinity & Brazos Valley, extension, 89; Wichita Valley, from Seymour to Weinert, 33. Total, 423.5 miles.

Railroad mileage constructed and in operation in Texas on June 30, 1905, as shown by the 14th annual report of the Railroad Commission of Texas, 11,745 miles; additional mileage constructed but not included in said report, 15. Total mileage constructed and in operation in Texas on June 30, 1906, 12,185.5 miles.

The above does not include some 250 miles of logging railroad and other private railroads, which are not recognized as common carriers by the Commission, nor does it include some electric interurban railroads.

The following is an approximate statement of the railroad mileage now under construction in Texas:

Galveston, Harrisburg & San Antonio, between Stockdale and Cuero, 8.4 miles; Houston & Texas Central, from Jewett to Navasota Junction, 66; Houston Belt & Terminal, in the city of Houston, 6; Kansas City, Mexico & Orient, between Red River and San Angelo, 158; Pecos & Northern Texas, from Canyon City to Plainview, 56; Trinity & Brazos Valley, between Houston and Waxahachie, 138; Texas Central, from Stamford west, 45; Wichita Valley, from Weinert to Abilene, 67. Total, 544.4 miles.

In addition to the above there is something more than 1,000 miles of railroad projected and chartered for immediate construction, some of which is reported having let contracts for construction, and the greater portion of which will probably be completed within the next few years. There is also several hundred miles of

electric interurban lines projected within the state, some of which has been chartered, and all of which may be regarded as being in favorable territory, and whose prospective business will warrant fully the construction of such projects.

Summary of Prosecutions Under Interstate Commerce Law.

Attorney-General Moody, complying with a resolution of the Senate, reports that under the Elkins law the Department of Justice has secured 36 indictments, resulting in nine convictions, two acquittals and three cases nolle prossed, leaving 22 cases still pending. Eleven of these indictments were for receiving rebates, 19 for granting rebates, five for conspiracy to obtain rebates, and one for conspiring to grant them.

In a report on the prosecutions under the original clauses of the interstate commerce law it is shown that since the passage of the act 84 indictments have been secured, of which 36 had been nolle prossed, 13 had been quashed, six dismissed, 12 were not prosecuted, six resulted in acquittals and 16 in convictions.

Of the $500,000 appropriated for the enforcement of the Sherman anti-trust law, the Attorney-General says that $204,709 has been expended, leaving an available balance of $295,291.

Australian Railroads—Increased Facilities and Earnings.

The railroads of Australia will during 1905-6 for practically the first time on record earn more than enough to pay full interest on capital expenditure. In 1902-3 there was a net deficit after paying interest of approximately $7,041,825, while in 1903-4 the deficiency was $3,552,545, and last year only $1,951,466. The results in 1904-5 were very satisfactory, for the railroads in Australia are not run for large profits, and in many instances costly lines have been built in advance of, but with the desire to aid, settlement. Any material increase in the population of the country would be immediately reflected in the earnings of the railroads, which promise to become shortly a much more valuable asset than in the past. The Victorian and New South Wales railroad revenue for the first nine months of the present financial year (to March 31) aggregate $29,788,638, an increase of $2,629,944 over the previous year. The New South Wales returns are exclusive of tramways, which also show a good gain. Good progress has also been made in Queensland, south Australia and western Australia.—*Consular Report.*

TRADE CATALOGUES.

Electrical and Pneumatic Tools.—Special circular No. 56 of the Chicago Pneumatic Tool Co., Chicago, is a four-page sheet illustrating special electrical tools and accessories, air-cooled electric drills, standard types of "Little Giant" drills, improved "Little Giant" drills with Corliss valves, and views of the various styles of Boyer and Keller pneumatic hammers.

Lightning Arresters.—Circular No. 1,132 of the Westinghouse Electric & Mfg. Co., Pittsburg, Pa., describes a number of standard devices for the protection of electrical apparatus against lightning. The devices shown include choke coils, gap units and arresters for a.c. and d.c. circuits both high and low tension.

Graphite.—The June number of *Graphite*, published by the Joseph Dixon Crucible Co., Jersey City, reports a new use for graphite. This is the coating of a creaking car with graphite at every point and seam where there could be friction. It is stated that trouble has been entirely stopped by this method.

Manufacturing and Business.

The Raymond Concrete Pile Co., Chicago, has opened an office at 71 Nassau street, New York, to take care of eastern business.

The Pittsburg Spring & Steel Co., Pittsburg, Pa., has appointed Edw. H. Barnes, Secretary of Railway Supply & Equipment Co., 805-7 Equitable Building, Atlanta, Ga., to represent it in the southern territory.

W. R. Sanborn, late Assistant Engineer of the Chicago, Indiana & Southern, has been elected Treasurer and General Manager of the Lehigh Stone Co., Chicago and Kankakee, Ill. The quarries of the company are at Lehigh, Ill.

Iron and Steel.

The Great Northern has ordered 15,000 tons of steel rails, the St. Louis & San Francisco 10,000 tons, and the Norfolk & Western 7,000 tons, all for delivery in 1907.

The Dominion Iron & Steel Co. has been given a contract by the Canadian Northern for 50,000 tons of 60-lb. rails. The company is now making 1,000 tons of rails for the Quebec & Lake St. John R. R.

The New York Central lines have closed contracts for 12 steel bridges and will soon ask bids for 15 additional bridges. The company will soon let contracts for about 200,000 tons of rails, and the Harriman lines will soon take 200,000 tons for 1907 delivery.

The Transcontinental Railroad Commission, Ottawa, has awarded the following contracts for supplies for the eastern section of the Grand Trunk Pacific: Steel rails.—Quebec delivery: Dominion Iron & Steel Co., 23,000 tons at $34 per ton. Port Arthur delivery: Algoma Steel Co., 32,000 tons at $34, of which 10,000 tons are to be delivered November, 1906, 22,000 tons June 1, 1907; Dominion Iron & Steel Co., 10,000 tons at $34.50, delivery Aug. 1, 1906. Splice bars.—Quebec delivery: Nova Scotia Steel & Coal Co., 1,317 tons at $47.04. Port Arthur delivery: Hamilton Steel & Iron Co., 2,241 tons at $43.68. Bolts.—Quebec delivery: Montreal Rolling Mills Co., 2,235 tons at $3.57½, August, September and November delivery; Gananoque Bolt Co., 1,072 at $3.41, May, 1907. Port Arthur delivery: Montreal Rolling Mills, 202,800 lbs. at $3.65 per 100 lbs., August, 1906; Toronto Bolt & Forging Co., 202,800 lbs. at $3.60 per 100 lbs., November, 1906; Gananoque Bolt Co., 202,800 lbs. at $3.44 per 100 lbs., June, 1907. Spikes.—Quebec delivery: Peck Rolling Mills, 1,188,200 lbs. at $2.50 per 100 lbs. Port Arthur delivery: Montreal Rolling Mills, 728,900 lbs. at $2.55 per 100 lbs., August, 1906; Toronto Bolt & Forging Co., 728,900 lbs. at $2.50 per 100 lbs., November, 1906; Hamilton Steel & Iron Co., 729,000 lbs. at $2.50, June, 1907.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Iron and Steel Institute.

At the joint meeting of members of the American Institute of Mining Engineers and of the Iron and Steel Institute in London July 24, 25 and 26, 1906 (see *Railroad Gazette*, April 26, page 127), the following papers will be presented:

(1) "Machine Moulding," by P. Bonvillain (Paris).
(2) "Tempering and Cutting Tests of High Speed Tool Steels," by Dr. H. C. H. Carpenter (National Physical Laboratory).
(3) "The Nodulizing and Desulphurisation of Fine Iron Ores," by A. Ladd Colby (New York).
(4) "Belgian Practice in Large Gas Engines," by Professor H. Hubert (Liége).
(5) "Electric Steel Smelting," by E. C. Ibbotson (Sheffield).
(6) "Different Methods of Blast Furnace Refrigeration and their Power Requirements," by J. E. Johnson, Jun. (Longdale, Va., U.S.A.).
(7) "The Crystallography of Iron," by F. Osmond (Paris).
(8) "German Practice in Large Gas Engines," by K. Reinhardt (Dortmund).
(9) "The Development of the Roe Puddling Process," by James P. Roe (Pottstown, Pa., U.S.A.).
(10) "The Constitution of Iron Carbon Alloys," by Albert Sauveur (Cambridge, Mass., U.S.A.).
(11) "The Influence of Silicon and Graphite on the Open-Hearth Process," by Alex. S. Thomas (Cardiff).
(12) "British Practice in Large Gas Engines," by Tom Westgarth (Middlesbrough).

At the meeting of the American Institute of Mining Engineers, several important papers dealing with Iron and Steel will be submitted, including the following:

(1) "Comparison of American and European Rail Specifications," by A. Ladd Colby (New York).
(2) "Piping and Segregation in Steel Ingots," by H. M. Howe (New York).
(3) "The Effect of Low Temperature on the Recovery of Steel from Overstrain," by E. J. McCaustland (Ithaca).
(4) "Improvements in Rolling Iron and Steel," by James E. York (New York).
(5) A Simple Distributor for Blast-Furnace Charges," by David Baker, (Philadelphia, Pa.).
(6) "A New Calorimenter for the Determination of Carbon in Steel," by Charles H. White, (Cambridge, Mass.)
(7) "The Gas-Producer as an Auxiliary in Iron Blast-Furnace Practice," by R. H. Lee (Liberty Furnace, Va.).
(8) "Internal Stresses and Strains in Iron and Steel," by Henry D. Hibbard (New York, N. Y.).
(9) "Heat Treatment of Steels containing 0.50 and 0.80 per cent. of Carbon," by C. E. Corson, Latrobe, Pa.
(10) Methods of Mining, Hauling and Screening Coal at the Mines of the Aldrich Mining Co., at Brilliant, Ala.," by T. H. Aldrich, Jr., (Birmingham, Ala.).
(11) Continued Discussion of the Gayley Dry-Air Blast Process.

Bennett H. Brough, Secretary, 28 Victoria street, London, S. W.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Georgia & Florida.—R. W. Bidgood has been appointed Auditor of the roads which are to compose this system.

Pacific Coast Co.—The general offices are being removed from San Francisco to Seattle, Wash.

Operating Officers.

Buffalo, Rochester & Pittsburg.—W. T. Noonan, General Superintendent, has been appointed General Manager.

Mexican Central.—R. N. Elliott has been appointed Superintendent of Terminals at Tampico, succeeding A. O. Merrick.

Roaring Creek.—R. G. Crossley, Chief Clerk to the Superintendent of the Pennsylvania division of the Delaware & Hudson, has been appointed Superintendent of the Roaring Creek.

Southern.—The office of the Superintendent of the Charlotte division will on July 14 be removed from Charlotte, S. C., to Greenville.

Traffic Officers.

Atlantic Coast Line.—T. C. White has been appointed General Passenger Agent, succeeding W. J. Craig, promoted.

Georgia & Florida.—A. Pope has been appointed Traffic Manager of the railroads which are ultimately to be operated under this name.

Illinois Central.—The traffic department has been rearranged as follows: W. R. Bascom, First Assistant General Freight Agent, to have charge of grain and grain products, live stock and lumber, part of the traffic interchanged with connecting lines north of the Ohio river, traffic between the northwest and the south, southeast and southwest, Pacific coast, New Mexico and Arizona traffic and matters pertaining to classifications.

G. W. Becker, Assistant General Freight Agent, Chicago—Traffic between points in northern territory on and east of the Mississippi river, and the south, southeast and southwest; lumber from Ohio and Mississippi river crossings and points south to points on and east of the Mississippi river.

J. R. Peachy, Assistant General Freight Agent, St. Louis—Traffic originating at and passing through St. Louis and East St. Louis; traffic on the St. Louis division; traffic on the Springfield division, East St. Louis to Litchfield inclusive; traffic interchanged with northern connections at junctions within the above territory, also traffic between the south and stations on the St. Louis division, including interchange with connecting lines within such territory.

V. D. Fort, Assistant General Freight Agent, Chicago—Traffic between stations on northern and western lines of the Illinois Central, except as otherwise assigned; brick, stone, cement, salt and ice traffic; matters pertaining to switching, weighing and inspection.

J. S. Weitzell, Assistant General Freight Agent, Omaha—Traffic interchanged with connecting lines at Omaha, Council Bluffs and Sioux City, also traffic to and from Missouri river points, Kansas City to Sioux City inclusive.

Las Vegas & Tonopah.—Harry Green, Chief Clerk in the passenger department of the San Pedro, Los Angeles & Salt Lake, has been appointed General Passenger Agent of the Las Vegas & Tonopah.

Engineering and Rolling Stock Officers.

Central of Georgia.—C. K. Lawrence, Engineer of Construction, has been appointed Chief Engineer, with office at Savannah, Ga., succeeding H. M. Steele, resigned.

Coahuila & Zacatecas.—Henry Scholfield, Consulting Engineer, has resigned.

Southern Pacific.—J. H. Wallace, Engineer of Maintenance of Way, has been appointed Assistant Chief Engineer, remaining in charge of maintenance of way, on which matters he reports direct to the General Manager.

LOCOMOTIVE BUILDING.

The Missouri Pacific has ordered 30 locomotives from the Baldwin Locomotive Works.

The Western Maryland has ordered 15 locomotives from the Baldwin Locomotive Works.

The St. Louis Southwestern has ordered 20 locomotives from the Baldwin Locomotive Works.

The Canadian Pacific, it is reported, is considering the placing of contracts for a large number of locomotives.

The Wabash, it is reported, has placed orders for 60 freight locomotives and 20 switching locomotives, all for 1906 delivery.

The Texas & Pacific has ordered 10 locomotives from the American Locomotive Company, to be built at its Rogers works.

The Pittsburg, Shawmut & Northern has ordered two consolidation locomotives and one Mallet locomotive from the Baldwin Locomotive Works.

The Newburg & South Shore, as reported in our issue of June 29, has ordered one simple mogul freight (2-6-0) locomotive and one simple six-wheel switching (0-6-0) locomotive from the American Locomotive Co., for September delivery. The mogul locomotive will weigh 148,000 lbs., with 130,000 lbs. on the drivers; cylinders, 20 in. x 26 in.; diameter of drivers, 52 in.; wagon top boiler, with a working steam pressure of 200 lbs.; 272 Shelby tubes, 2 in. in diameter and 12 ft. 1¼ in. long; Carnegie firebox, 107 in. x 41¼ in.; tank capacity, 4,500 gallons, and coal capacity, nine tons. The switching locomotive will weigh 133,000 lbs.; cylinders, 20 in. x 26 in.; diameter of drivers, 52 in.; straight top boiler, with a working steam pressure of 200 lbs.; 220 Shelby seamless steel tubes, 2 in. in diameter and 11 ft. $7^{1}/_{16}$ in. long; Carnegie firebox, 112 in. x 31¾ in.; tank capacity, 4,500 gallons, and coal capacity, eight tons. The special equipment for both includes: Westinghouse-American air-brakes, Gollmar bell ringer, magnesia sectional boiler lagging and Sterlingworth brake-beams for switching locomotive, Climax couplers, Monitor injector, Jerome and American Locomotive Co. piston and valve rod packings for mogul locomotive, and Leach sanding devices.

CAR BUILDING.

The Delaware & Hudson is in the market for 100 ballast cars.

The Seaboard Air Line, as reported in our issue of June 22, has ordered 611 flat cars from the American Car & Foundry Co.

The New Orleans & Northeastern has ordered 115 additional flat cars and 60 box cars from the American Car & Foundry Co.

The Rio Grande, Sierra Madre & Pacific has ordered 500 flat cars from the Pullman Co. for the Cananea Consolidated Copper Co.'s extension from Temosachie.

The Isthmian Canal Commission in addition to the 1,000 flat cars reported ordered in our issue of June 29, has ordered 100 ballast cars and 17 passenger cars from the American Car & Foundry Co.

The Charleston Consolidated Railway, Gas & Electric Co. has ordered four semi-convertible cars from the J. G. Brill Co. These cars will have a seating capacity for 32 persons and will measure 20 ft. 8 in. long by 7 ft. 8½ in. wide by 9 ft. 1 in. high, all inside dimensions; the bodies will be of wood and the underframes will be of wood and metal. The special equipment will include Brill 21E trucks fitted with G. E. 67 motors; Brill rattan car seats, open vestibules, and National Wheel Co.'s wheels.

The Canadian Pacific is building one sleeping car, one baggage commissariat car, 88 flat cars and 14 stock cars at its Angus shops. The sleeping car will be 72 ft. long by 9 ft. 10½ in. over frame; it will be provided with 12 sections, one smoking room and one state room; the body and underframe will be of wood. The baggage commissariat car will be of the same over all dimensions, and will be fitted with permanent inside fittings for refreshments. The flat cars will be of 60,000 lbs. capacity and will measure 36 ft. 8 in. long by 8 ft. 10 in. wide. The bodies and underframes will be of wood. The stock cars will also be of 60,000 lbs. capacity, and will measure 36 ft. 8 in. long by 9 ft. 5 in. wide by 7 ft. 1¼ in. high. The bodies and underframes will be of wood. The special equipment for all will include Westinghouse air-brakes, Tower couplers, Minor tandem draft rigging, Simplex brake-beams, double bolsters for sleeping and baggage cars, and Simplex bolsters, with Susemihl side bearings for stock and flat cars. Harrison dust guards, McCord journal boxes, all steel diamond pattern trucks with Barber rollers and cast-iron wheels for both stock and flat cars, and Pantasote curtain material, Forsyth roller curtain fixtures, Gold heating system, Standard Steel Co.'s platforms, six-wheel trucks, Pullman vestibules and 36¼ in. diameter steel-tired wheels for both sleeping and baggage cars.

RAILROAD STRUCTURES.

Buffalo, N. Y.—The Wabash, it is announced, is planning to build a passenger station on the old Hamburg Canal property recently purchased at Buffalo, N. Y.

Carman, Man.—The Midland of Manitoba (Great Northern), it is reported, will build 32 bridges on its line between this place and Neche, N. Dak., just south of the international boundary. E. Brown, Mayor, Portage la Prairie, Manitoba, is President of the company.

Little Rock, Ark.—An ordinance has been passed by the city council granting land to the St. Louis, Iron Mountain & Southern as part of the site on which the union passenger station is to be built. The new station will cover two acres of ground at the corner of Cove and New Markham streets, and will cost $400,000.

MACON, GA.—Ground, it is said, has been bought at this place for putting up a large union passenger station.

MACKEY'S FERRY, N. C.—If the Norfolk & Southern succeeds in securing its permit to build a bridge over Albemarle sound the structure will be over five miles long. The plans call for a structure 27,200 ft. in length. There will be only one track on the bridge. There will be a draw 700 ft. wide of the lift type. Objections to the bridge will be heard at a public hearing at Edenton, N. C., during the week of July 23.

MARYSVILLE, CAL.—The Northern Electric Company, which is building an extension of its Chico-Oroville line from Oroville, Cal., to Marysville via Yuba City, has offered to make its new railroad bridge across the Feather river between Yuba City and Marysville a double deck structure to replace the old wooden county bridge spanning that stream, provided that the two Counties of Sutter and Yuba bear an equitable share of the expense.

MOBILE, ALA.—The Louisville & Nashville, it is said, is planning to enlarge its freight house here.

SAN FRANCISCO, CAL.—The Western Pacific has secured property at the southwest corner of Ninth and Bryant streets in San Francisco, where it is understood the main passenger station is to be built.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

CANADIAN PACIFIC.—An officer writes that the extension of the Kootenay Central from Golden, B. C., southeast to Fort Steel or Jaffray will be about 180 miles long. Only ten miles will be completed this year, from Golden south. This will be done by the British Columbia General Contract Co. The track will be laid by the company's men.

The company will spend $100,000 this summer in improving the Esquimalt & Nanaimo branch. A similar amount will be expended each year until the roadbed is up to the standard.

The Nicola branch in British Columbia was opened July 2.

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CHATHAM, WALLACEBURG & LAKE ERIE (ELECTRIC).—This company, it is said, proposes to extend its electric line from Chatham to Rondeau Harbor, 20 miles, and is making surveys for a line to Sarnia, 40 miles.

CHICAGO & NORTH-WESTERN.—This company is to spend $3,000,000 for improvements on the Ashland division during the present season. Reducing grades and straightening curves will form the most important part of the work.

Part of the extension from Manitowoc, Wis., northwest 74 miles to Gillette will shortly be placed in operation to Maribelle, 16 miles north of Manitowoc. The distance to Green Bay, through which this line will pass, is about 49 miles, and to Gillette from Green Bay about 25 miles.

The company is also building a line from Kneeland Junction south to Shawano, through Forest, Langlade and Shawano Counties, to open new territory. The plans for operating this line have not yet been definitely outlined. Both these lines will greatly facilitate shipments over the Ashland division, which is being made a low grade line for the speedy transportation of freight. (See Construction Record; also June 22, p. 181.)

A contract has been let by this company to Kilpatrick Bros. & Collins, of Omaha, for building a 26-mile extension from Bonesteel west. The contract calls for the completion of the work by Sept. 15. More than half of the work has been already sublet and grading is to be started at once. (June 22, p. 181.)

CHICAGO, BURLINGTON & QUINCY.—This company, it is reported, will build a line from Gillette, Wyo., east through Spearfish, S. Dak., to a connection with the Great Northern at Ellendale, N. Dak., or Aberdeen or Huron, S. Dak. There is to be a bridge over the Missouri river at Pierre.

CHICAGO, MILWAUKEE & ST. PAUL.—This company, it is reported, has opened a new cut-off between Defiance and Early, Ia., on the main line to Omaha, shortening the distance a mile and reducing the grade from 74 to 34 ft. The company is also laying a second track between Watertown and Portage, Wis., and at points between La Crosse and Minneapolis.

CLINTON, CHEYENNE & CANADIAN.—Incorporated in Oklahoma with $1,000,000 capital to build a line from Clinton in Custer County, Okla., which on the Chicago, Rock Island & Pacific, and the St. Louis & San Francisco, west to Canadian on the Atchison, Topeka & Santa Fe, in Hemphill County, Texas, about 100 miles.

CUBA RAILROADS.—The Cuban Senate has passed the House railroad subsidy bill, appropriating $6,000 per kilometre for the construction of twelve branch railroad lines, which will be feeders for the Van Horne system (the Cuba railroad). The subsidies are to be paid at a rate not exceeding $500,000 annually until all the roads are completed.

President Palma has decided to approve the bill. This measure gives the Van Horne people full control of the transportation situation in central and eastern Cuba. (June 8, p. 167.)

GASSAWAY, ELK RIVER & HUTTONSVILLE.—This company, chartered in West Virginia to build from Gassaway, W. Va., south to Webster Springs, approximately 25 miles, will start work at once, and it is proposed also to build an extension from Webster Springs to Huttonsville. (April 27, p. 129.)

HOUSTON, SABINE & RED RIVER.—A contract has been let to C. Rice and work has been started on this line. The proposed route is from Houston, Tex., north and northeast to Alexandria, La., about 200 miles via Spurger, Jasper and Burkeville, Tex., and Leesville, La. About 22 miles of the grade has been completed. H. W. Cortes is President; Edwin Kennedy, Vice-President, and J. M. Cotton, Secretary, all of Houston. (See Houston, Beaumont & Red River in Construction Record.)

LOUISIANA & PACIFIC.—See Shreveport, Alexandria & Southwestern.

MAINE CENTRAL.—This company has a large force of men at work double-tracking its line from Newport, Me., to Carmel, 12 miles. When this is completed the road will have a double track between Portland and Bangor, except on three sections.

MIDLAND VALLEY.—Plans, it is reported, are being made by this company for extending its line from the southern terminus at Hoye, Tex., south to Texarkana, about 150 miles.

MITCHELL MINING CO.—This company, which is composed of a number of Pittsburg capitalists, at a recent meeting in Washington, D. C., considered the question of issuing $1,000,000 in bonds to build a railroad from the company's copper mining plant at La Dicha, Guerrero, Mex., southwest to a point on the Pacific coast, approximately 183 miles.

NORTHERN PACIFIC.—Announcement is made that this company has started work on a section of the Port Townsend Southern. Surveys are being made from Quilcene, Wash., south to connect with the main line, probably at Olympia. (June 1, p. 161.)

OMAHA & DENVER SHORT LINE.—Incorporated in Colorado and in Nebraska with $12,500,000 capital to build a railroad from Denver, Colo., east through Adams, Washington and Yuma Counties in Colorado, and Cheyenne, Rawlins, Decatur, Norton and Phillips Counties in Kansas. The route through Kansas has not been definitely determined. In Nebraska it will pass through Harlan, Franklin, Kearney, Adams, Clay, Fillmore, York, Seward, Lancaster, Saunders, Sarpy and Douglas Counties to Omaha, 500 miles air line. The offices of the company will be in Denver and in New York. C. M. Allaire, C. S. Devere, D. B. Ellis, C. L. Horton and P. Robinson are directors. Three of the directors, C. M. Allaire, C. L. Horton and C. S. Devere, are eastern capitalists who are said to have been instrumental in financing the project. Of the incorporators, Samuel F. Rathvon is Secretary and Treasurer of the United Oil Co.; Frederick R. Ross is a well-known real estate man in Denver; Daniel B. Ellis, George A. H. Fraser and Percy Robinson are connected with the law firm of Rogers, Cuthbert & Ellis, attorneys of the Colorado Eastern. This company operates 17 miles of road from Denver east to Scranton, and it is thought that one of the trunk lines not having terminal facilities of its own in Denver contemplates securing those of the Colorado & Eastern.

PACIFIC & EASTERN.—The application for a charter made by Col. Pellatt and other Toronto capitalists, representing this company, which intends building a line from Victoria, B. C., northeast to Fort Churchill, on Hudson's Bay, has passed the Canadian Senate. (May 4, p. 136.)

POLAND, BOARDMAN & CANFIELD.—See Youngstown & Southern.

PORT TOWNSEND SOUTHERN.—See Northern Pacific.

RALEIGH & PAMLICO SOUND.—It is said that the various points to be connected by this line and the distances are as follows: Raleigh east to junction with Seaboard Air Line, 2.23 miles; Pamlico Junction to Knightward, 12.1 miles, thence to Wendell, 4.9 miles; Wendell to Zebulon, 4.73 miles; Zebulon to Wilson, 24.6 miles; Wilson to Stantonsburg, 10 miles; Stantonsburg to Farmville, 13.1 miles; Farmville to Greenville, 12.1 miles; Greenville to Chocowinity, 16.6 miles; Chocowinity, thence south to Newbern, 28.14 miles, and Chocowinity east to Washington, 3.78 miles; a total of 132.28 miles, with a branch from Farmville south to Snow Hill, 11 miles. Connections will be made with the Seaboard Air Line at Pamlico Junction, the Atlantic Coast Line at Wilson and at Greenville, with Norfolk & Southern at Washington. John W. Stewart, of Raleigh, N. C., is Chief Engineer. Construction contracts have been let to J. G. White & Co., of New York, and for rails, spikes,

bolts, joints and frogs to the Pennsylvania Steel Co., of Steelton, Pa. (See Construction Record.)

ST. JOSEPH & NODAWAY VALLEY.—Incorporated in Missouri with $800,000 capital to build a line from St. Joseph, Mo., north to Graham, in Nodaway County, through Buchanan, Andrew and Nodaway Counties, about 35 miles. W. C. Wilson, T. E. Denny, A. C. Snyder and T. E. Fleming are incorporators.

SHREVEPORT, ALEXANDRIA & SOUTHWESTERN.—Contracts are being let by this company for extending the Louisiana & Pacific from DeRidder, La., south via Bon Ami and Ramsey to Banks, approximately 37 miles. The work includes the reconstruction from narrow to standard gage of 18½ miles of line. Three miles of the balance are already graded and all of the right-of-way secured.

SOUTHERN PACIFIC.—The first division of the Guaymas-Guadalajara extension, being built under the name of the Cananea, Yaqui River & Pacific, is finished. It extends from a point on the Sonora line a short distance above Guaymas, near Batamotal, east to Torin, about 50 miles. The line has been inspected by a Government engineer and will be opened at once. (See Construction Record.) The extension south from Torin will cross the Yaqui river a short distance below that place, on a steel bridge, to be built at a cost of $650,000.

SUFFOLK TRACTION.—Incorporated in New York with $1,000,000 capital to build an electric line from Brookhaven, Long Island, west via Bellport, Patchogue, Blue Point, Bayport, Sayville and Islip to Babylon, 28 miles. Associates of the Brooklyn Rapid Transit Company are interested in the company, together with men in business along the route. Herbert Siebert is a director.

TIDEWATER DEVELOPMENT CO. (ELECTRIC).—An officer writes that contracts for building this proposed line will be let in November. The route is from Gadsden, Ala., southwest via Ashville, St. Clair Springs, Springville, Huffman, East Lake, Woodlawn, Avondale, Birmingham, Thomas, Pratt City, Ensley, Bessemer, Brookwood and Holt to Tuscaloosa, about 125 miles. From this point the company will operate steamship lines south on the Warrior, Tombigbee, Alabama and Mobile rivers to Mobile. The work will be easy and requires only a few small bridges, with no tunneling. (June 15, p. 175.)

WESTERN MARYLAND.—A contract, it is said, has been given to Fisher, Gilmore & Reiley of Baltimore for reconstructing and double tracking this road from Owings Mills, Md., north to Emory Grove, 6½ miles.

YOUNGSTOWN & SOUTHERN.—The Poland, Boardman & Canfield Railway Co. has been organized at Sharon, Ohio. The company is affiliated with the Youngstown & Southern, which has built a line from Sharon to Columbiana, and it is proposed to connect with other towns in eastern Ohio.

RAILROAD CORPORATION NEWS.

ATLANTA, BIRMINGHAM & ATLANTIC.—This company has increased its capital from $14,000,000 to $24,000,000, the capital now consisting of $8,000,000 preferred stock and $16,000,000 common.

BIRMINGHAM SOUTHERN.—See Tennessee Coal, Iron & Railroad.

BLACK MOUNTAIN.—See Virginia & Southwestern.

BOSTON & MAINE.—R. L. Day & Co., Lee, Higginson & Co., Kidder, Peabody & Co., and Estabrook & Co., who recently bought the $10,000,000 4 per cent. 20-year refunding bonds of this road, are offering $8,000,000 of the bonds for sale at 103 and interest. The proceeds will be used to retire $7,724,500 Eastern Railroad Co. 6 per cent. certificates of indebtedness.

HOCKING VALLEY.—This company is to issue $5,400,000 additional common stock, making the total outstanding $16,400,000. The new stock is to be exchanged for Kanawha & Michigan stock.

INDIANA, COLUMBUS & EASTERN TRACTION.—The roads to be merged into this company are the following: The Dayton, Springfield & Urbana, the Urbana, Bellefontaine & Northern, the Columbus, London & Springfield, the Columbus, Grove City & Southwestern, the Columbus, Buckeye Lake & Newark, the Columbus, Newark and Zanesville, the Columbus & Lake Michigan, the Dayton & Western, the Dayton & Northern, the Dayton & Muncie and the Zanesville Railway, Light & Power Co. (June 29, p. 190.)

INDIANAPOLIS & CINCINNATI TRACTION.—Charles L. Henry, President of this company, now operating 70 miles of interurban electric line out of this city, was appointed receiver for the company on July 3d on application of a stockholder. It is alleged that the company is unable to meet outstanding indebtedness of $500,000, though assets are in excess of liabilities.

INTERBOROUGH-METROPOLITAN.—The New York Stock Exchange has listed $67,406,000 collateral trust 4½ per cent. bonds of 1956, $45,284,600 5 per cent. cumulative preferred stock and $92,360,100 common stock. In its application for the listing of these securities, the company made the following statement of the stocks and bonds now owned by it: Three hundred and thirty-seven thousand and thirty-two shares of Interborough Rapid Transit stock; 422,846 shares of Metropolitan Street Railway Company stock; 289,171 shares of the stock of the Metropolitan Securities Company; 17,800 shares Subway Realty Company stock; 32,045 shares New York & Queens County Railway Company stock; 59,870 shares Rapid Transit Subway Construction Company stock; 1,981 shares Pelham Park Railway Company stock; 1,990 shares City Island Railroad Company stock; 938 shares New York & Long Island Railroad Company stock; one-half interest in 5,000 shares preferred stock of New York & Long Island Traction Company; one-half interest in 14,707 shares common stock of New York & Long Island Railroad Company; one-half interest in $1,000,000 4½ per cent. mortgage bonds of New York & Long Island Traction Company; one-half interest in 5,980 shares Long Island Electric Railway Company stock; one-half interest in $600,000 first mortgage 5 per cent. gold bonds of Long Island Electric Railway Company.

INTERNATIONAL & GREAT NORTHERN.—See Missouri, Kansas & Texas of Texas.

KANSAS CITY SOUTHERN.—This company has accepted the terms of the act of Congress, recently passed, for transfer of the Port Arthur canal to the United States. By the terms of the act Port Arthur becomes a port of entry.

LEHIGH VALLEY.—The Supreme Court of Pennsylvania has decided that this company must pay back dividends, amounting to 100 per cent., on its $106,300 preferred stock. This sustains the decisions of lower courts. (Feb. 2, p. 38.)

MISSOURI, KANSAS & TEXAS OF TEXAS.—This company is now running its through trains to and from San Antonio, Texas, by way of Austin instead of Smithville. The cut-off leaves the main line at Granger; from there to Austin, 77 miles, the M., K. & T. is used and trackage rights have been obtained over the International & Great Northern for the 30 miles between Austin and San Marcos, where a connection is made with the M., K. & T. main line again. By the new route the time is shortened about an hour.

NATIONAL OF MEXICO.—See Rock Island Co.

PIGEON CREEK.—See Virginia & Southwestern.

READING COMPANY.—The gross earnings of the Philadelphia & Reading Railway for the month of May were $3,289,052, a decrease of $261,425; net earnings, $1,086,826, a decrease of $435,572. The P. & R. Coal & Iron Company shows a deficit of $3,024 for May, as compared with net earnings of $325,463 a year ago.

ROCK ISLAND COMPANY.—It is reported that interests identified with this company have bought the Texas-Mexican Railroad from the National of Mexico. The T.-M. runs from the Rio Grande river to Corpus Christi, 162 miles.

TENNESSEE COAL, IRON & RAILROAD.—This company has bought back from the Southern and the L. & N. the Birmingham Southern, which operates a number of railroads from Birmingham, Ala., to various iron mines, aggregating 26 miles. The T. C. I. & R. R. owned the B. S. until 1900, when it was sold to the two companies mentioned for $1,100,000.

TEXAS-MEXICAN.—See Rock Island Co.

TOLEDO & WESTERN (ELECTRIC).—C. F. Franklin has been appointed receiver for this company, which operates 67 miles of road from Toledo to Fayette, Ohio, and a branch to Adrian, Mich. The company also controls the Toledo, Fayette & Western, which has 14 miles of road. The company was unable to meet the July interest on $50,000 of Toledo, Fayette & Western bonds, guaranteed by the Toledo & Western.

VIRGINIA & SOUTHWESTERN.—It is reported that this company has bought the Black Mountain Railroad, which runs from Darbey, Va., to Intermont, 23 miles, and also the Pigeon Creek Railroad, which runs from Intermont to the Imboden Coal & Coke Co., 2 miles.

WABASH.—The directors have approved the proposition to issue $200,000,000 in bonds, and also the plan for the retirement of the A and B debenture bonds. (June 15, p. 176.)

Lee, Higginson & Co., Boston, and Clark, Dodge & Co., New York, are offering, at a price to yield 5 per cent., $6,180,000 Wabash 4½ per cent. equipment bonds maturing semi-annually from January 1, 1907, to July 1, 1916, inclusive. The bonds are secured on 60 freight locomotives, 20 switching locomotives, 4,000 steel underframe 50-ton capacity coal cars and 2,000 40-ft. box cars of 40 tons capacity.